The Electrical Industry's Weekly Magazine June 8, 1959

Electrical World

A McGraw-Hill Publication Price 50 Cents

CLEVELAND-1975 ▶

TOUGH TEST for survival of downtown "core" is effectiveness of long-range planning. Cleveland businessmen have developed this land-use model, with new facilities shown in white, existing in gray

How CEI Helps Shape Downtown Cleveland...

. . . page 52

New 161-Kv Line Built for Future Bundling... page 6

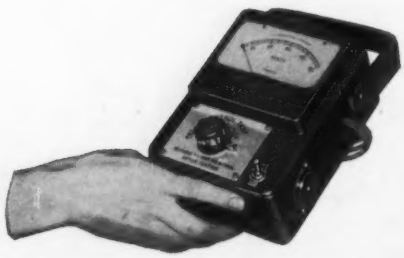
STEVENS RICE GS
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH

ALLIS-CHALMERS modern line for '59

. . . simpler regulator control

- **Provides more accurate settings**
- **Saves operator's time**
- **Eliminates customer complaints**

Now when you adjust or test voltage level and band width there's no need to change customer voltage. No more customer complaints of high or low voltage. With *Caliband* control the job is simpler than ever before. Adjusting a single knob is all it takes . . . operator's time for accurate settings is greatly reduced.



CALIBAND control demonstrated

Caliband control is so simple it can be demonstrated and explained at your desk with an actual unit in a small portable kit. Contact your nearby A-C office for a demonstration, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS
Originators of 5/8% Step Regulators

A-5912

Caliband is an Allis-Chalmers trademark.

Electrical World

Vol. 151, No. 23 June 8, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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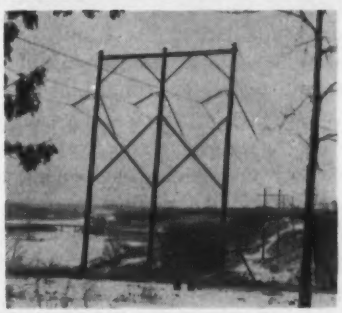

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CURRENT EVENTS

CEI Helps Shape Downtown Cleveland

Utility plays role in planning long-range improvement for downtown area in this mid-west metropolis.....p 52

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Public Service E&G's Sewaren Station handles by-product on efficient basis for sale as concrete filler.....p 58

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W. E. Campbell, Arizona Public Service Co

Proves suitable for sectionalizing duty on 140-mi circuit, and has lower first cost than oil circuit breaker.....p 76

TRANSMISSION

161 Kv Line Built for Future Bundling

Frank W. Shaw, Kansas City P&L Co

Pole strengths, heights, anchoring for two conductors per phase. Additional guys to be installed later.....p 64

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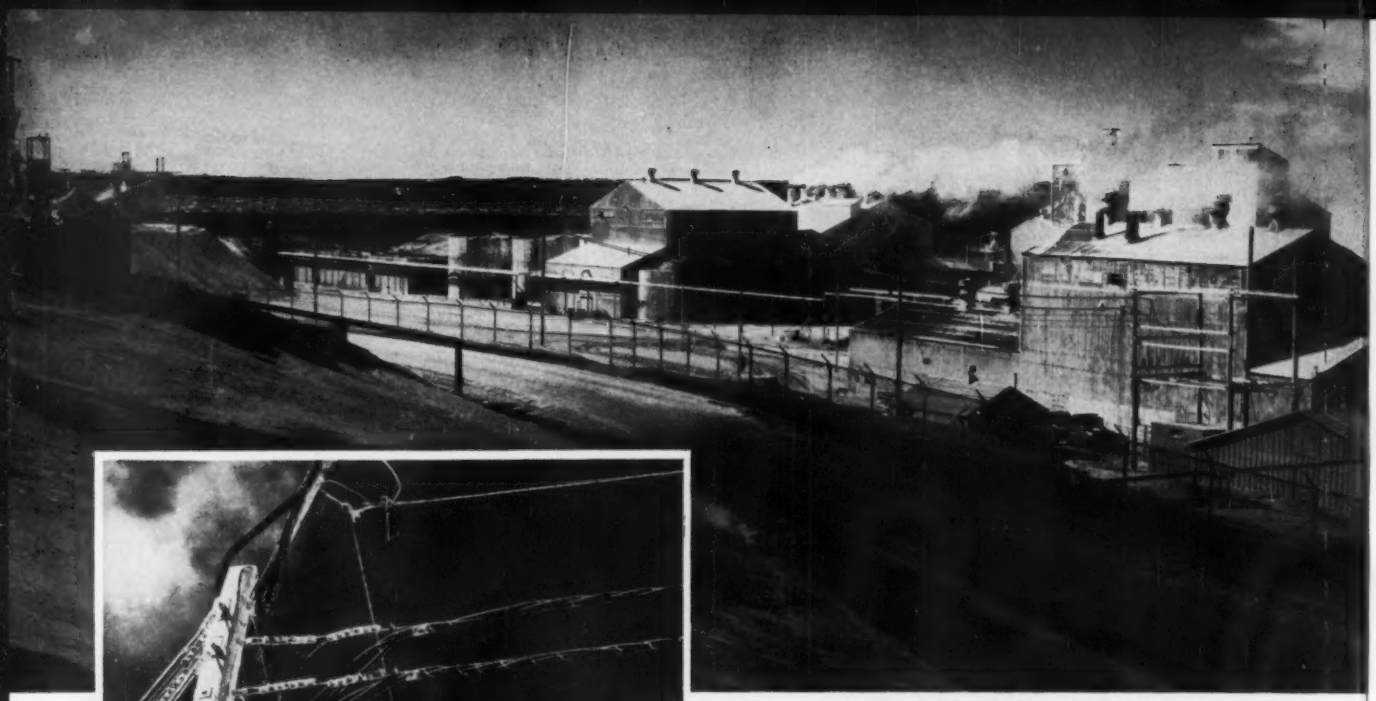

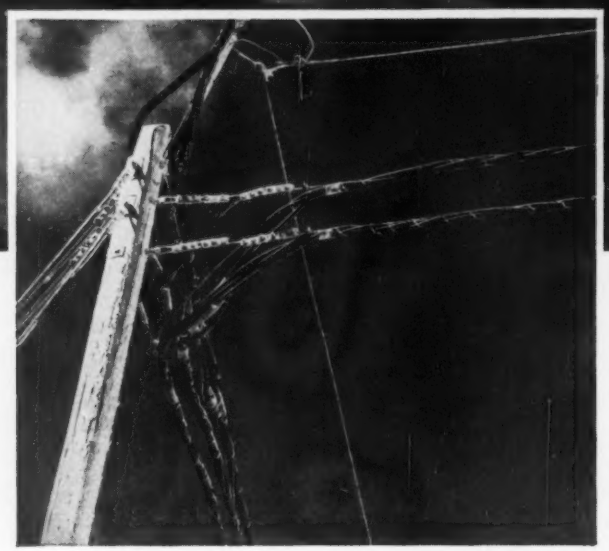

As the power goes . . . so go the operating costs at Intermountain Chemical Co.'s highly mechanized mining and refining operation. And every bit of this power—for digging, hoisting and processing of the ore—comes from Intermountain's power plant through 5kv non-shielded Okolite-Okoprene self-supporting aerial cables. They needed utmost dependability—and got it!

Heavy concentration of corrosive soda ash dust and severe environmental conditions have no effect at all on this aerial cable. Note the simple, low-cost support pole—no cross-arms needed—as well as the easy installation and splicing procedures used for this light weight, unshielded 5kv cable.

Okolite-Okoprene Aerial Cables withstand chemical contamination . . . assure continuous production at Intermountain

"These 5,000-volt aerial cables have withstood heavy concentrations of soda ash dust for eight years now," says Louis Ruffini, staff assistant to the maintenance superintendent for Intermountain Chemical Company of Wyoming. "They've proved to be invulnerable to temperatures as low as —40°F and as high as 120°. They've faced winds up to 70 mph, and they tested perfectly at 40,000 volts d-c. We expect them to be around a long time yet."

These facts are vital to Intermountain. The company depends almost completely on electrical power to mine trona ore and refine it into almost half a million tons of soda ash per year. That's why they stress the dependability of their Okolite-Okoprene, 3/c, self-supporting power cables with aluminum conductors, cables that distribute power to every sub-station in the mine and processing plant.

"Installation of the aerial cables was very simple," says Mr. Ruffini, "thanks to their flexibility, light weight, and self-supported Dualay construction . . . and due also to the unshielded 5,000-volt construction that permitted the simplest of splicing and terminating procedures."

For *your* power needs, this construction can offer installation and operating economics, combined with long-term dependability. Okolite insulation has a 30-year record of service, maintaining in severest installation conditions its high dielectric strength and great resistance to corona cutting, moisture and heat. Okoprene sheath offers unusual protection against weather, abrasion, ozone, heat, cold, many acids, alkalies and chemicals. Application by the strip process of both insulation and sheath is the final assurance of matchless performance and long life. For the Okolite-Okoprene self-supporting aerial cable that best suits your needs, see 56-page Bulletin EW-1074. It's free . . . just write The Okonite Company, Passaic, N. J.

***where there's electrical power . . . there's* OKONITE CABLE**

6216

Public Relations At Its Best.

The Pacific Gas and Electric Co has released information showing that the pension funds operated for state, county, city, district and school employees in California have 43 percent of their assets invested in public utility bonds and debentures. It points out further that of the more than one billion dollars invested in public utilities, $156 million is invested in California utilities.

The release of such information to the press strikes us as being public relations at its best. Here we have an item that affects the pocketbook of over a half million public employees. If published by the newspapers, it will reach a most important segment of the voters and those involved in regulation and taxation.

The utilities have so many stories like this one that can be told. They collect taxes to pay the government employees and then provide the safe investment for pension funds along with providing extremely reliable electric service.

Fischer Black

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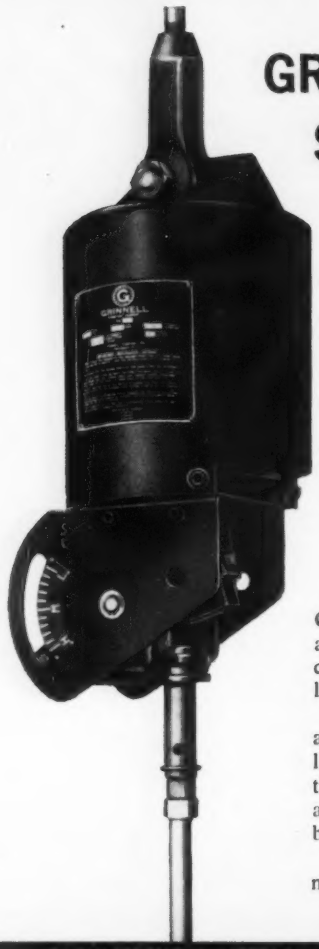


GRINNELL CONSTANT SUPPORTS...

2 BASIC DESIGNS... 11 DIFFERENT METHODS OF ATTACHMENT

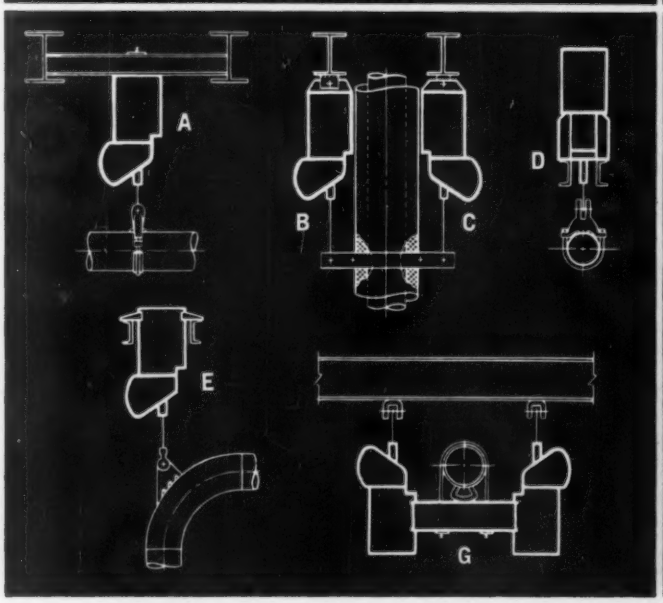
Grinnell Constant Supports are available in a range of sizes to provide capacities for loads from 27 lbs. to 57,500 lbs., with travels up to 16 inches.

Both vertical and horizontal hangers are designed to operate in extremely limited space. In the selection of types, there is a choice of 11 methods of attachment to structures—either above, between, or below supporting steel.

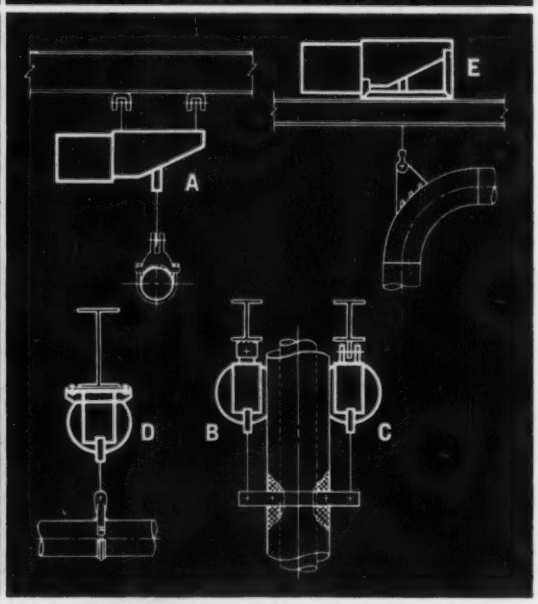
Grinnell Constant Supports provide mathematically perfect load support throughout all positions of travel . . . also a full 70 percentage points of adjustability is built into them. No less than 10% of this adjustability is allowed either side of calibration for plus or minus change in load. Field readjustments are easily made by turning a single load adjustment bolt.

Call on Grinnell's Pipe Suspension Department for help with your pipe suspension problems. Grinnell Company, Providence 1, Rhode Island.

FOR VERTICAL ATTACHMENT



FOR HORIZONTAL ATTACHMENT

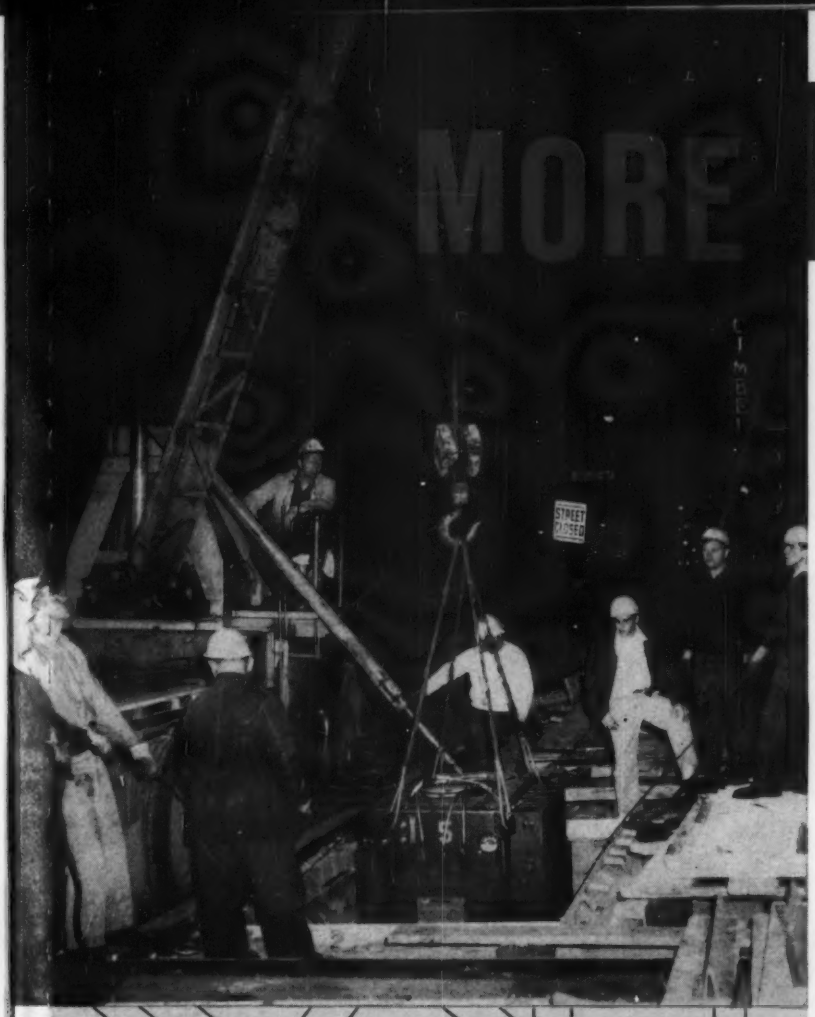


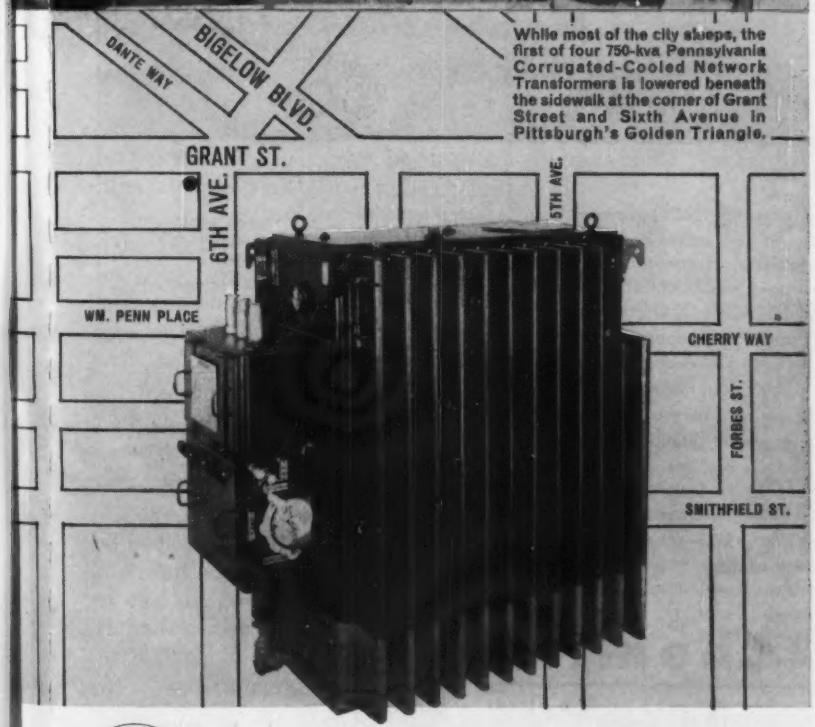
GRINNELL

AMERICA'S No. 1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

MORE POWER

goes underground for Pittsburgh's renaissance





While most of the city sleeps, the first of four 750-kva Pennsylvania Corrugated-Cooled Network Transformers is lowered beneath the sidewalk at the corner of Grant Street and Sixth Avenue in Pittsburgh's Golden Triangle.

Golden Triangle Gets New Pennsylvania Network Transformers with Corrugated Cooling

An important part of Pittsburgh's much acclaimed "renaissance" is going underground, as Duquesne Light Company installs additional power distribution equipment to meet the challenge of increasing loads in the Golden Triangle.

Beneath the sidewalk at Grant Street and Sixth Avenue, four 750-kva Pennsylvania Network Transformers have been installed to serve the lighting and power needs of one of Pittsburgh's newest skyscrapers. In keeping with other aspects of the renaissance, these transformers were designed and built with the *future* in mind. All are provided with Corrugated Cooling —the modern network transformer tank design that greatly simplifies maintenance and helps eliminate corrosion.

There are no ledges or crevices on which the corrosive materials that are characteristic of most sidewalk vault installations might collect. The smooth, straight walls of the corrugations are easy to clean and easy to paint—even from above the transformer. Coupled with the use of low-alloy, high-strength, corrosion-resistant steel, such ease of maintenance provides highly effective protection against corrosion.

Whether your own network transformer needs stem from a community renaissance or routine replacements, it will pay you to investigate the advantages of Pennsylvania Corrugated-Cooled Network Transformers. Contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

PENNSYLVANIA TRANSFORMERS

PENNSYLVANIA NETWORK TRANSFORMERS

NAUGATUCK PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER

Now—the finest weather-resistant wire jackets can be Colored!

FOR SALES APPEAL • FOR SERVICE EASE

New Paracril OZO—a superior rubber compound developed by Naugatuck—makes possible *new eye appeal, new ease of identification*. And it outperforms standard wire jacket compounds many other ways, too!

Compare new PARACRIL OZO with other wire jacket rubbers. Prove for yourself, new PARACRIL OZO gives:

- significantly superior ozone resistance
- greater fuel and oil resistance
- much greater abrasion resistance than standard jacket compounds
- excellent processability, with particularly fast extrusion
- *permanent retention of bright colors!*

If you are not already using PARACRIL® for your wire jacket compounds or similar products requiring such properties, chances are 1000 to 1 it's because you haven't yet *tried* PARACRIL OZO.

Why *not* try it—soon. Contact your nearest Naugatuck representative at the address below.

Naugatuck Chemical

Division of United States Rubber Company

613P Elm Street
Naugatuck, Connecticut

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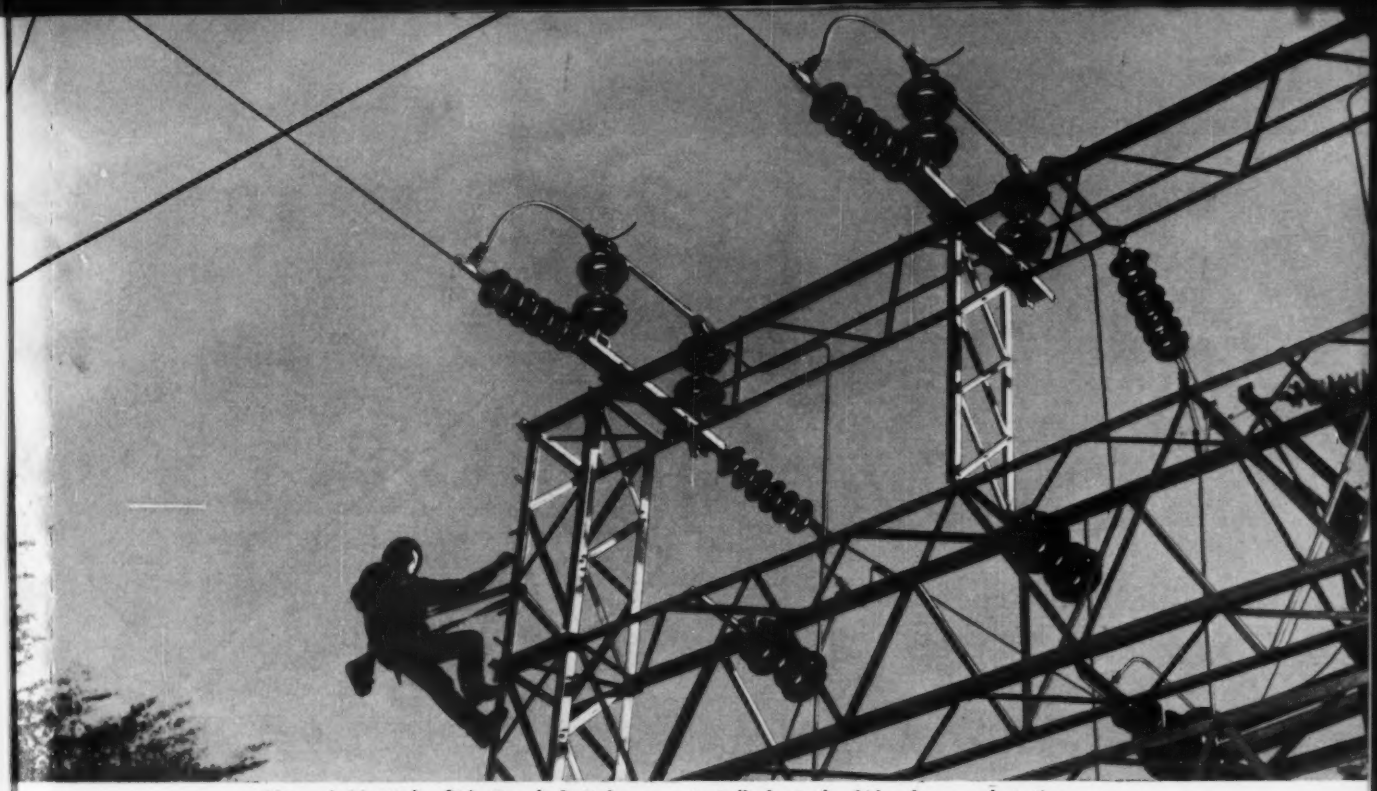


These L-M 69 kv Side-Break Switches are installed at the Woodacre substation of Pacific Gas & Electric Company, in Marin County, California.

Storms, Sleet, Corrosion Can't Stop These Tough L-M Side-Break Switches

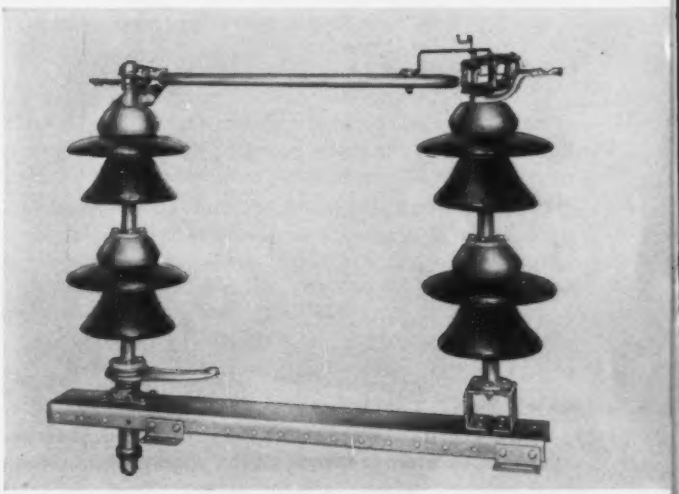
L-M Type PH Side-Break switches are ruggedly designed, with high current-carrying capacity built in. This is achieved by having only six current transfer points, high-pressure silver-to-silver contacts and heavy back-up metal.

Switches like those shown have come through lightning storms which blew protective fuses on the load side, without damage. L-M 69 kv side-break switches have been opened with line charging current on the line, under near-emergency conditions with no observable damage to the switches.

This strength and overload ability is typical of L-M equipment, which is built to do more than just meet standards. That's why so many utility engineers depend on L-M equipment — it's reliable.

For information on L-M power switches, packaged substations, transformers, Kyle reclosers, and other distribution apparatus, ask the L-M Field Engineer or call any of L-M's sales offices. Line Material Industries, Milwaukee 1, Wisconsin.

395R



L-M 69 KV SWITCH. Available in sidebreak (above), and vertical break, for any standard mounting. Outstanding features are the powerful lever action for breaking ice and corrosion; heavy silver-to-silver inserts in high-pressure contacts; high current capacity; silicone-cord-ring-sealed bearings for easy operation; extremely flexible for misalignment.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

McGRAW EDISON

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

JUNE IS L-M SUBSTATION MONTH!

New L-M Feeder-Pak® Provides Compact, Low-Cost, Low-Voltage-Side Unit

Shipped in pre-wired, assembled sections, ready for fast, economical installation in substation as complete 15 kv feeder unit.

by **W. V. SWAN,** Product Manager
Power Switching Equipment
Line Material Industries

The new L-M Feeder-Pak is a complete unit for the low-voltage side of a substation. It provides support for feeder conductors, disconnect and by-pass switches, lightning arresters, current transformers, and substation-type R or W three-phase Kyle heavy-duty recloser.

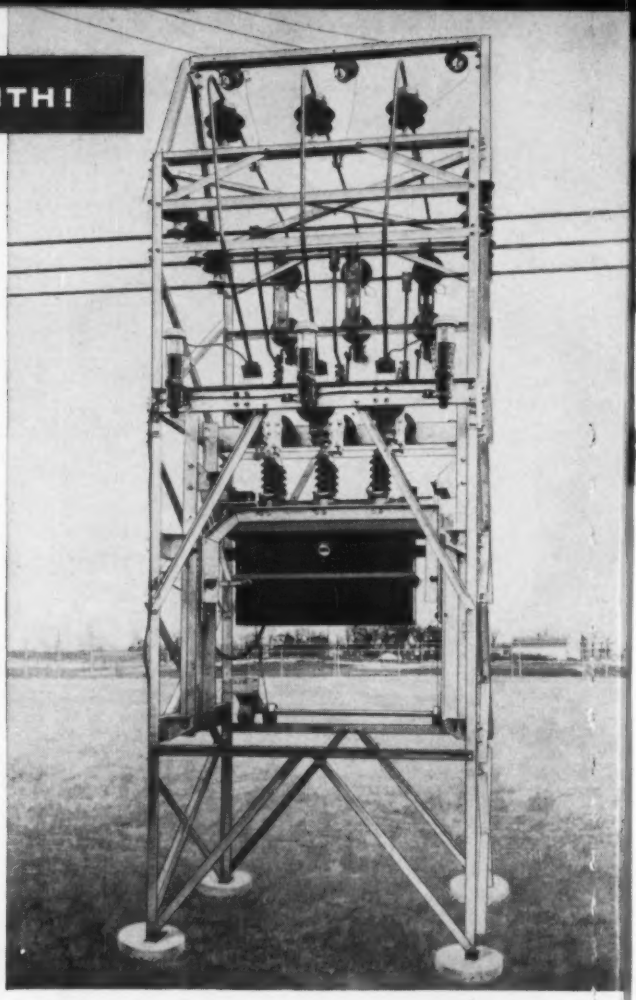
Neat, Compact

The unit has a very neat appearance. It is compact, easy to install. The whole unit comes in easy-to-handle crates. Additional units can easily be added when additional feeders are needed. Or units can be removed to other locations.

The Feeder-Pak costs about the same as the *materials* for a conventional open-type feeder position, but installation costs are far lower. Bus, insulators, switches, and arresters are all in place. No concrete pad is needed—only footings for the four legs. And it takes less land area—it's only 5 feet, 4 inches square!

Easy to Install

To erect the L-M Feeder-Pak, simply bolt the lower section to the concrete footings; set the upper section into the lower section and bolt; raise the recloser into position with the hoisting mechanism included in the lower section. Self-aligning bayonet-type contacts work automatically as recloser is raised into position. Automatic interlock prevents lowering the recloser until recloser contacts are opened.



THE NEW L-M FEEDER-PAK. The lower pre-assembled steel section contains the recloser, and recloser lifting frame and lifting mechanism. The unit is neat, compact. Base is only 5 feet, 4 inches square. It saves land, cuts installation and maintenance time. No mounting pad is required—just footings for the four legs.

L-M Feeder-Pak Features

1. With Kyle Type R or W recloser provides complete structure and equipment for low-voltage side of the substation.

2. Complete; compact; neat. Saves land costs; requires no pad; cuts installation man-hours.

3. Shipped as partly assembled units, crated for easy handling. Switches, arresters, and recloser disconnects are all pre-wired, and installed. Current transformers if desired.

4. Additional feeder positions are easy to add; or the Feeder-Pak may be removed to another location if desired.

5. Recloser lifting frame and tank lifting device make recloser maintenance safe and simple.

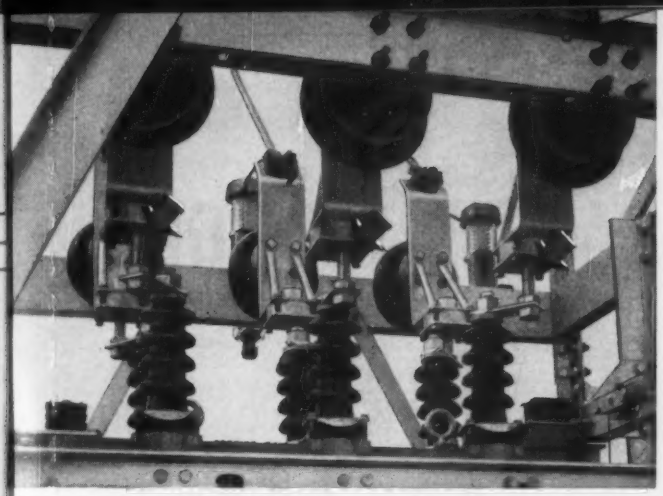
LINE MATERIAL® Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

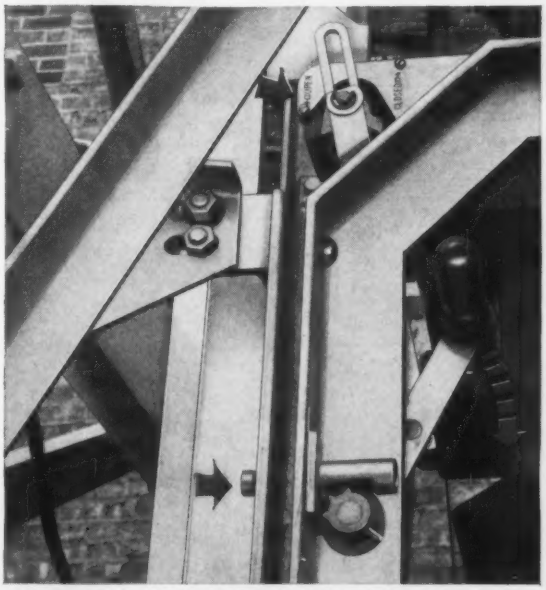
Substations and Power Switching Equipment®

399

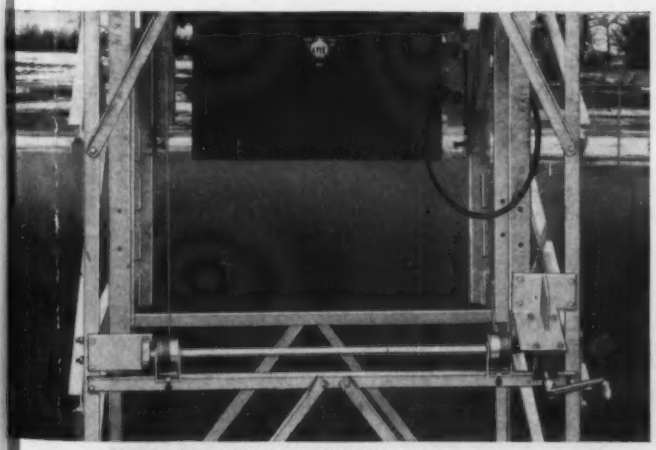
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



BAYONET CONTACTS on the recloser bushings are raised into the self-aligning automatic disconnects when the recloser is lifted into position. Thus connections are made safely, simply, and automatically.

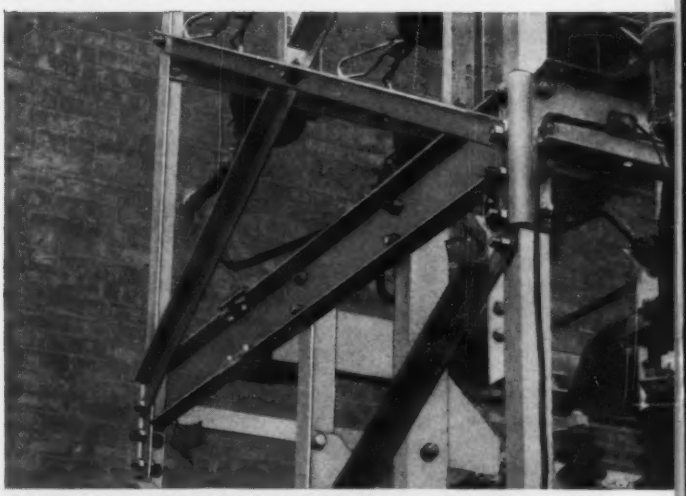


CONTROL LEVER INTERLOCK. Recloser cannot be lowered until recloser contacts have been opened by moving the handle down (arrow).



RECLOSER LIFTING MECHANISM makes it easy to lower the recloser, and, if desired, to lower the tank to inspect the mechanism, change coils or time-current characteristics —which is easily and accurately done on Kyle reclosers— or for periodic oil change.

LINEMAN CLOSES BYPASS SWITCHES before lowering the recloser. These are L-M Type HXO heavy-duty fused switches. They are mounted on the frame and connected to the bus at the factory.



WHEN LOWER FRAME IS MOUNTED ON FOOTINGS, upper sections are simply mounted into position and bolted to the lower section at the corners. This is all it takes to assemble the entire unit!

Get This Data on New L-M Feeder-Pak

Let us provide complete information on standard equipment and optional accessories. Then check your own present and proposed substation locations to see how this new L-M Feeder-Pak will save you money and man-hours, installation and maintenance. Talk to the L-M Field Engineer. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

When you buy Motor Starters--

YOU PAY FOR OVERLOAD PROTECTION

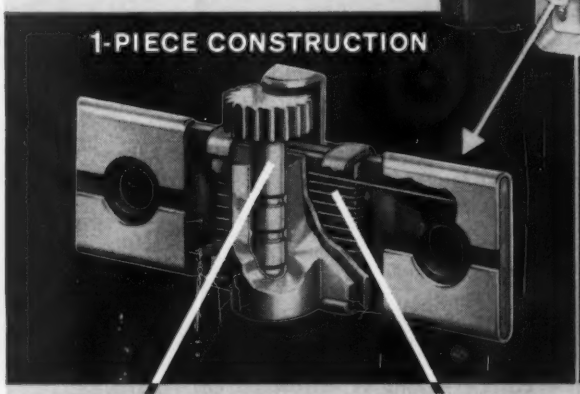
...BE SURE YOU GET IT!

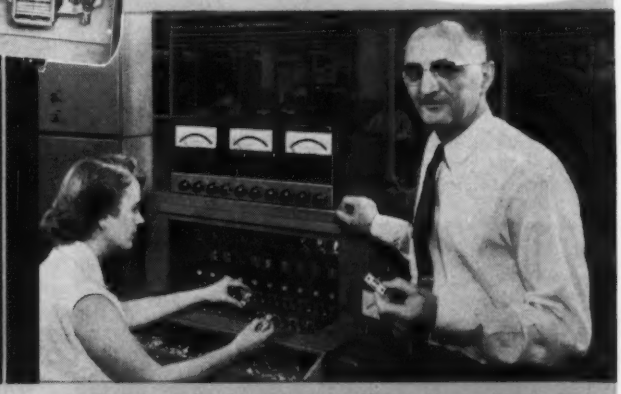
Only ONE-PIECE Overload Relays give 100% Protection • Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction • ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect accuracy.

Insist on Square D melting alloy thermal overload relays

***Write** for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.*





Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

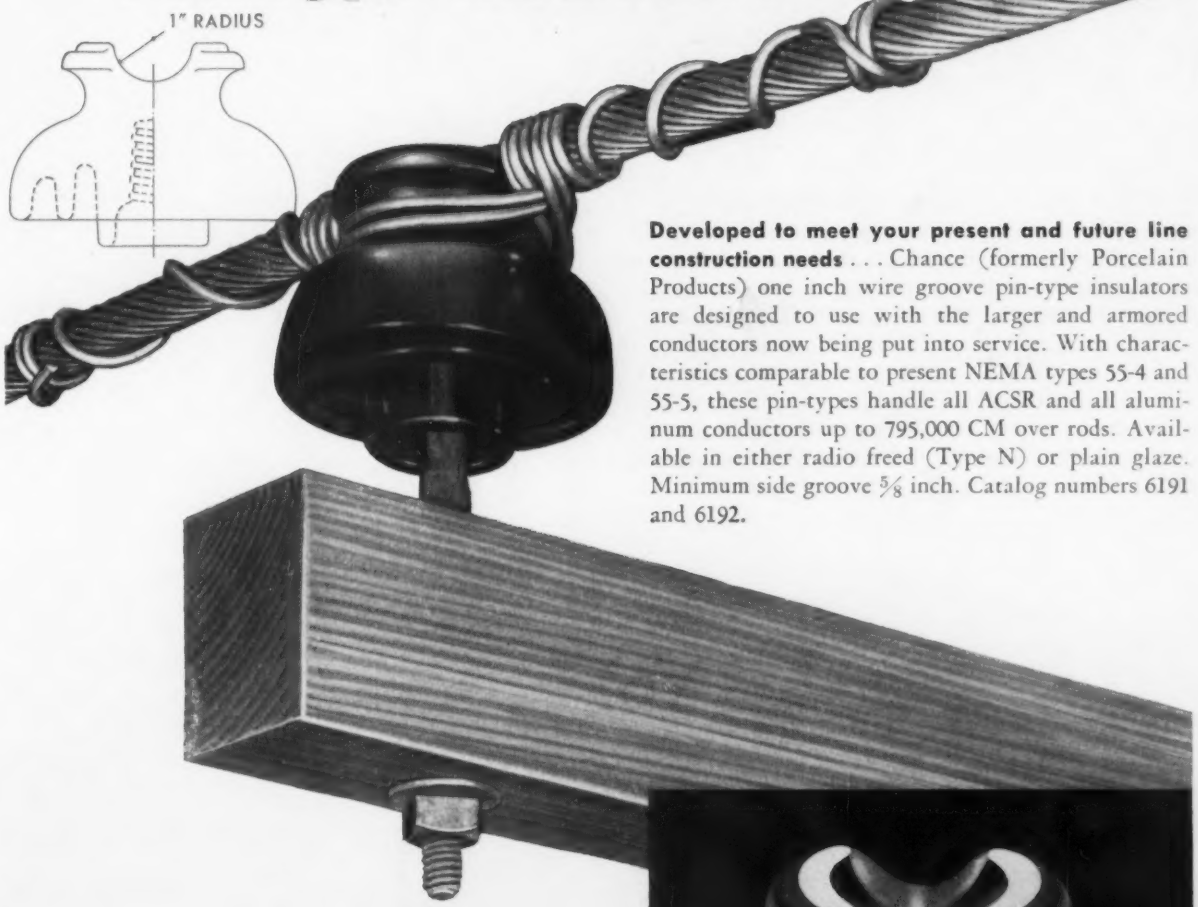
Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Individual factory inspection of every Square D melting alloy thermal overload relay means performance you can trust. Each unit is calibrated and thoroughly tested to make sure it will perform according to its rating.

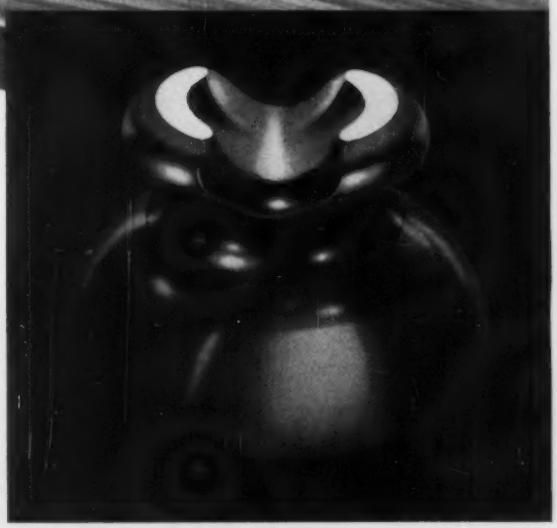
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

Large conductors seat securely in CHANCE 1" radius wire groove Pin-Type Insulators



Developed to meet your present and future line construction needs . . . Chance (formerly Porcelain Products) one inch wire groove pin-type insulators are designed to use with the larger and armored conductors now being put into service. With characteristics comparable to present NEMA types 55-4 and 55-5, these pin-types handle all ACSR and all aluminum conductors up to 795,000 CM over rods. Available in either radio freed (Type N) or plain glaze. Minimum side groove 5/8 inch. Catalog numbers 6191 and 6192.



Type N Glaze Prevents Radio-TV Interference

Type N Glaze on Chance Pin-Type Insulators prevents interference from developing at the insulator. NO OVERLAY, NO UNDERCOAT—but a permanent, hard, smooth, vitreous, conductivity-controlled glaze at conductor groove, tie wire groove and in the pin hole. Type N is readily identified by a distinctive black color.

HERE'S A NOISEPROOF INSULATOR WITHOUT EQUAL

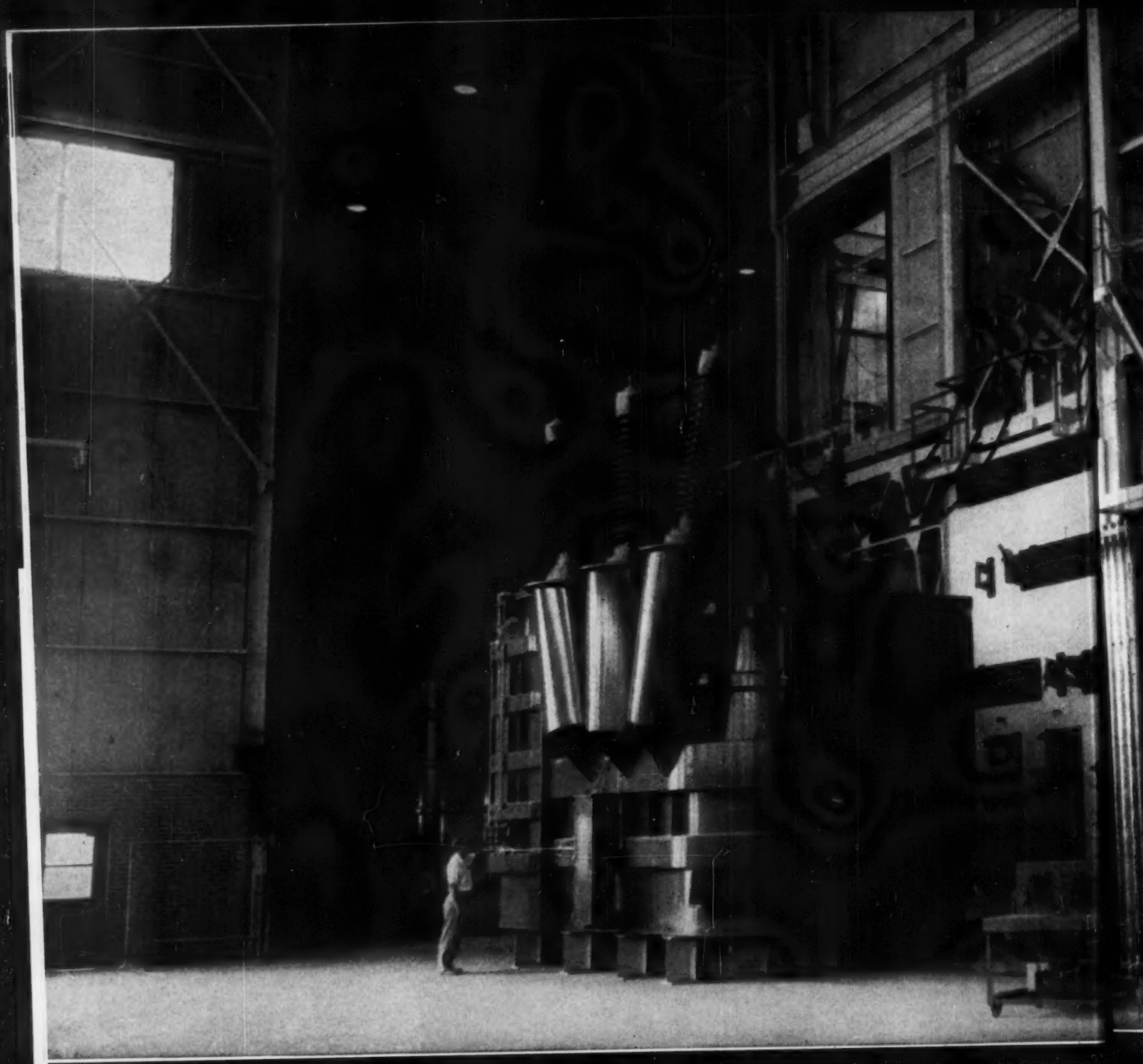
ABC INDUSTRIES

A. B. CHANCE COMPANY

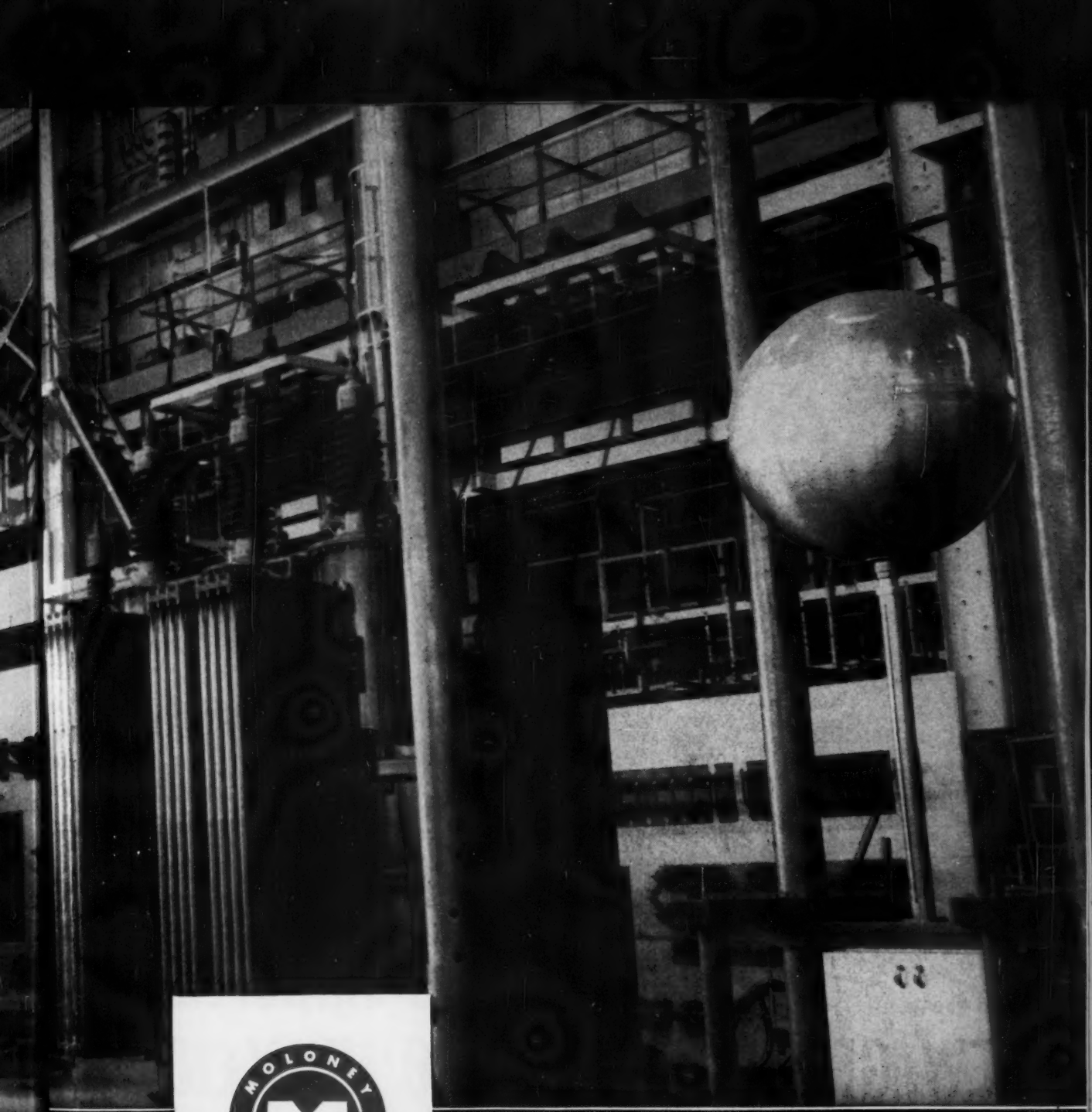
CENTRALIA, MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

C159-17



PROVING GROUND



The "Proving Ground" for Moloney Power Transformers is this large, fully-equipped test area suitable for testing the largest of transformers.

Each Moloney Power Transformer undergoes thorough tests to prove that it meets industry standards and Moloney's high standards of quality and performance.

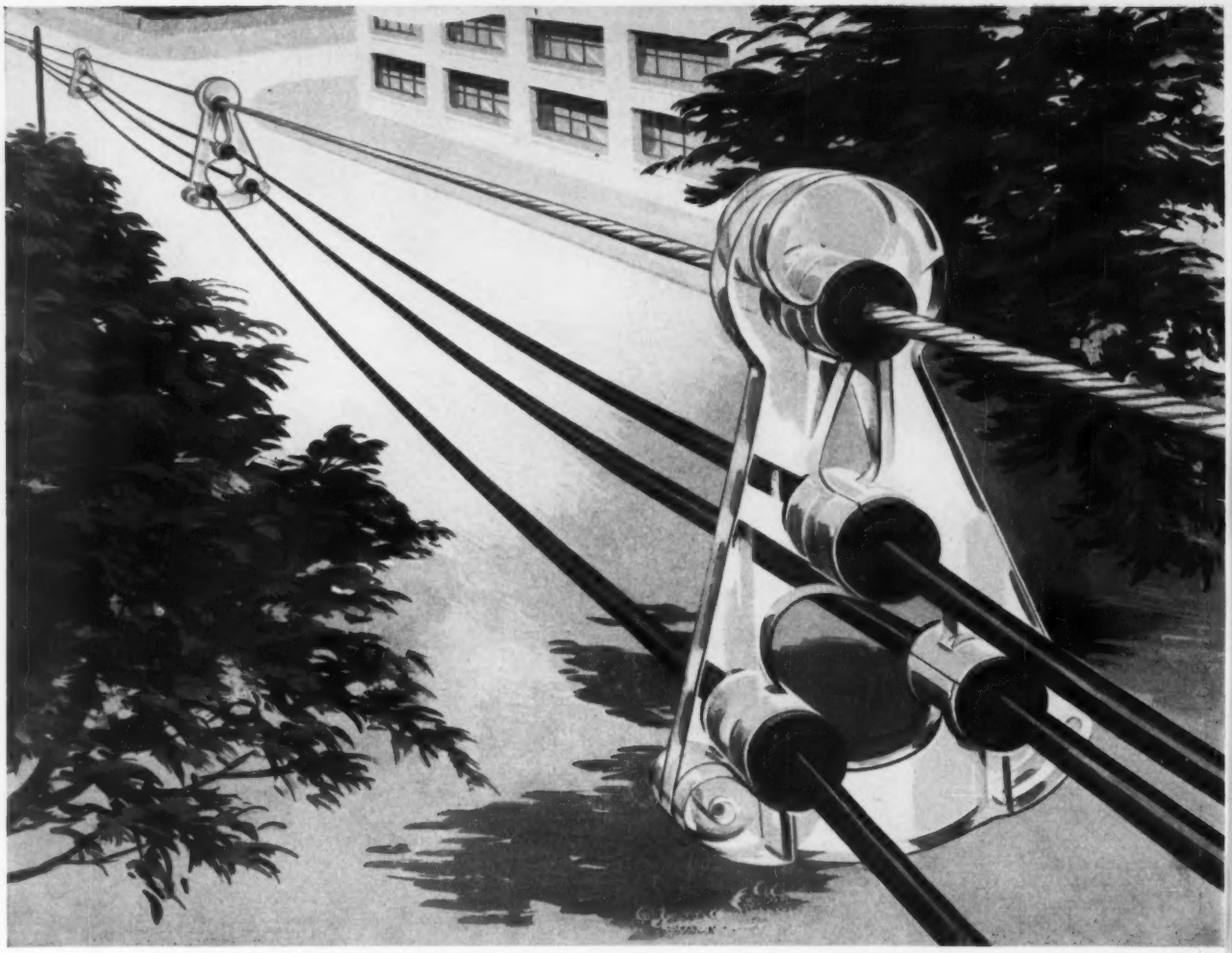
Thus, the test bay shown here can aptly be called the proving ground for future performance . . . the payoff of constant research and development programs.

Specify power transformers that are designed, built and proven to give efficient, dependable performance . . . Specify Moloney Transformers, All Along The Line.

ME 58-27

MOLONEY ELECTRIC COMPANY

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA



Check these 9 important NEW GENERAL ELECTRIC VULKENE*

In the General Electric Vulkene Cable—

1.—improved mechanical properties
2.—heat stability
3.—light weight
4.—small diameter

In the specially engineered spacers—

5.—quick, easy, lower-cost installation
6.—greater freedom from dust and dirt
7.—reliability in service

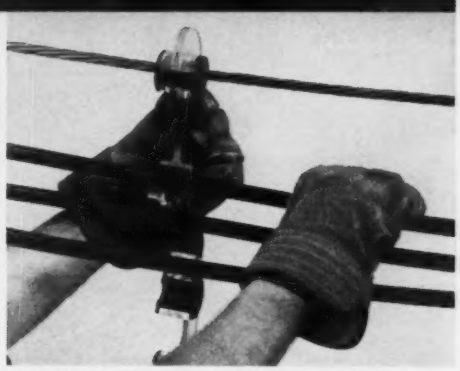
*Trade-mark General Electric Company.

Progress Is Our Most Important Product

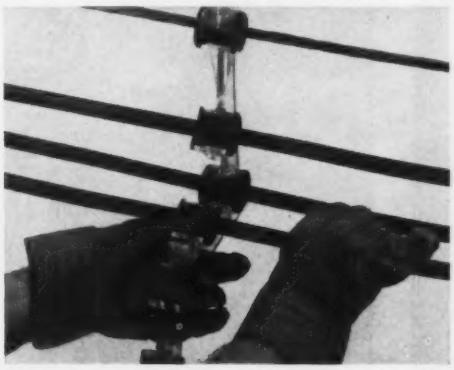
GENERAL ELECTRIC

"WRAP-AROUND" INSTALLATION IS QUICK, EASY.

(1) Slide the unit over the messenger. Grommet grasps messenger securely—no need to hold it in place manually.

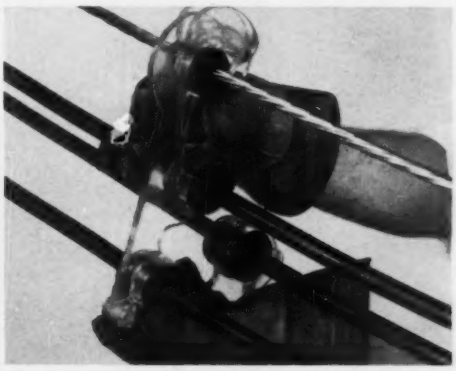


(2) Place first cable on next grommet. Half-sectioned grommet makes a curved shelf in which the cable will rest.



(3) (a) Place second cable between half-sections of next grommet. Start "wrap-around" by slightly closing spacer around cable.

(b) Place third cable on the half-section of next grommet. Continue "wrap-around" by raising and closing spacer around cable.



(4) Complete the "wrap-around." Squeeze closed the self-latching, positively-locking spacer. The installation is now complete—without bolts, nuts, positioning of separate parts, or separate small parts to misplace or drop—and it's easily done, wearing gloves in severe cold, if necessary.

advantages built into the AERIAL SPACER CABLE SYSTEM

In the complete system—

8.—economical, compact overhead distribution

9.—year-in, year-out service reliability for which General Electric products are famous

You'll find comparable special advantages and features built into other wires and cables in General Electric's comprehensive line. These features and advantages, the result of extensive research and years of design and manufacturing experience, offer you important values when you buy and install G-E wires and cables.

For further information on the G-E Vulkene aerial spacer cable system, just mail the coupon below.

General Electric Company
Wire and Cable Department
Section W-222-627
Bridgeport 2, Conn.

Please send me your new booklet on the G-E Vulkene aerial spacer cable system.

Name.....

Title.....

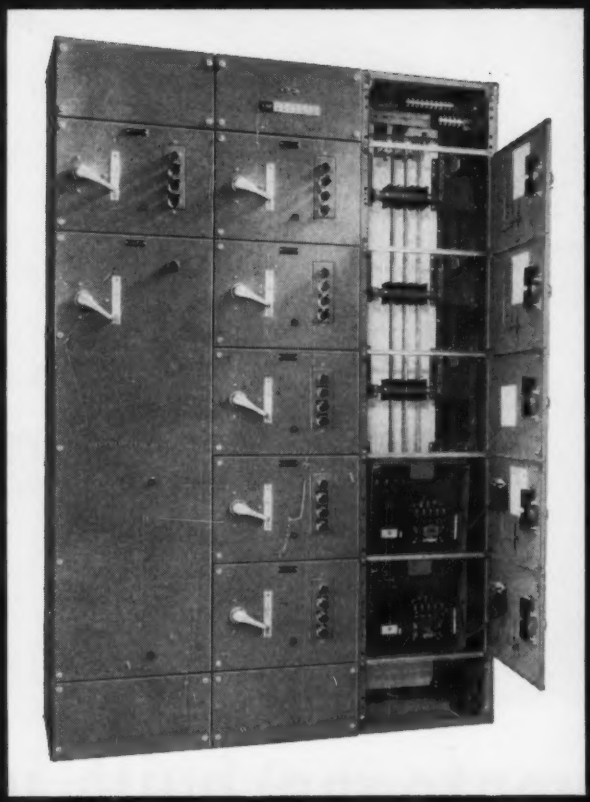
Company.....

Address.....

City..... Zone..... State.....

In Control Centers...

Federal Pacific gives what you're looking for



RELIABILITY

BOLTED CONSTRUCTION—11-gauge formed channels bolted together for maximum structure rigidity.

POSITIVE PLUG-IN CONTACTS—special beryllium copper alloy stabs provide high-pressure, low-resistance unit-connections to silver-plated bus.

TESTED TO WITHSTAND 25,000 AMP RMS SHORT CIRCUIT STRESSES.

FLEXIBILITY

PREPUNCHED STRUCTURES—for unmatched job flexibility...individual units or complete sections can be added, removed or interchanged to meet varying job requirements—present and future.

COMPACT DESIGN—up to 20 units can be mounted in a single vertical section.

EASY WIRING—oversize wiring spaces simplify initial installation and facilitate change of units.

SAFETY

UP-FRONT UNIT RELEASE—completely disengages unit from energized bus... can be locked in open position to prevent accidental contact.

FULLY ENCLOSED UNITS—steel barriers isolate each unit from adjacent parts.

DOORS MOUNT ON STRUCTURE—prevent accidental contact with energized bus when starter unit is removed.

Nothing has been left to chance in the design of this control center. Structure, starters, and protective devices have all been carefully engineered, manufactured and coordinated by Federal Pacific to assure the highest standard of operating efficiency and dependability—as well as to provide unified responsibility for performance. For complete details write for Bulletin 2-2000A, Federal Pacific Electric Company, General Offices: Dept. 305, Newark 1, New Jersey.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment

The Electrical Week

LATE NEWS ▶

Washington Wire . . . Sen Murray (D-Mont.) cancels his proposed conference with Interior Dept on preference customer power needs in the Missouri Basin because Interior Secy Seaton does not plan to attend . . . House Appropriations Committee overrides Administration's "no new starts" policy by including 260,000-kw Little Goose project on the Snake River in fiscal '60 public works funds recommendations . . . Joint Committee on Atomic Energy votes eight A-plant reactors at a cost of $230 million. It rejects ninth reactor, a 50,000-kw BWR . . . Sen Wayne Morse comes out against federal multi-purpose power dam on Potomac River.

Rates and Regulation . . . Central Hudson G&E gets New York PSC approval to up rates $300,000 a year, vs $1,720,000 requested . . . Con Ed gets commission OK to eliminate conjunctional billing over next five years . . . Orange & Rockland Utilities asks PSC approval to hike rates an average of 45¢ a month for residential, $1.50 for commercial.

New York Gov Rockefeller orders survey of state's power needs in the next ten years. Some observers believe study portends change in state's power policy.

Computers slated to provide automatic control for two units at Southern California Edison's Huntington Beach Station.

Pension funds are heavy investors in utility securities. Pacific G&E survey shows 43% of California government and school pension funds are in public utility bonds and debentures.

Management changes . . . Louisiana P&L elects G. C. Rawls president, succeeding W. O. Turner, who becomes chairman. E. A. Rodrigue becomes vp . . . Mississippi P&L names L. O. Bradshaw vp, sales . . . Georgia Power promotes T. S. Davis, Jr, to vp, Columbus Division, succeeding E. M. Clapp, who retires Sept. 1st.

WEEKLY POWER OUTPUT—UP 14.4% (Week ending May 30), Kwhr 12,761,000,000

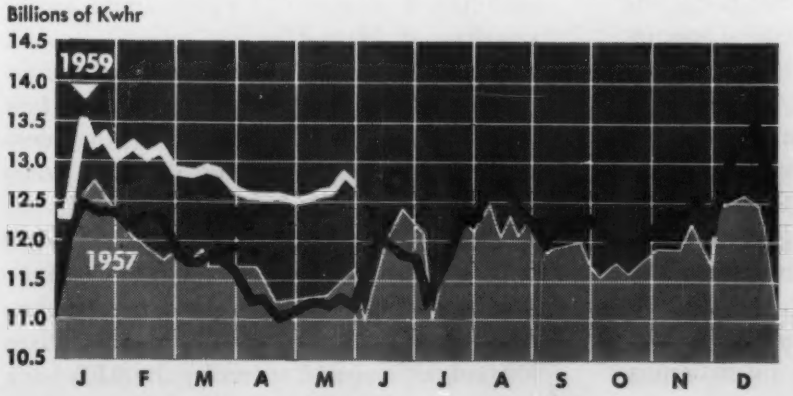


Figure above is estimated

Regional figures not available

Per Cent Change From Previous Year

	May 16	May 23	May 30
Total U. S.	+12.7	+14.3	.....
New Eng.	+ 9.0	+12.2	.....
Mid. Atlantic ..	+12.4	+14.1	.....
Cent. Ind.	+17.6	+18.7	.....
West Cent.	+ 8.9	+11.6	.....
Southeast	+ 8.7	+ 8.8	.....
South Cent. ...	+14.1	+19.6	.....
Rocky Mount ..	+ 9.9	+10.4	.....
Pacific			
NW	+12.7	+19.4	.....
SW	+14.0	+12.1	.....

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **A bold approach to problems of the downtown area** has been taken by Cleveland businessmen. Their "master plan" charts the course to a revitalized "core" by 1975. How Cleveland Electric Illuminating Co supports the move is the heart of this week's cover story **(p 52)** . . . Private-vs-public power fight has brought some new wrinkles in a study backed by Vermont Commission **(p 54)** . . . The rebound in industrial power use is boosting output figures **(p 55)** . . . Ceremony marks the start of construction of GE's "Project EHV" **(p 56).**

ENGINEERING ▶ **Kansas City P&L's new 161-kv line is adaptable to future bundling.** The 10.7-mile line, supported by wood poles and H-frames, can have a second set of conductors added with minimum of line changes **(p 64)** . . . Vacuum interrupter switches prove satisfactory for line and load-dropping on Arizona Public Service 230-kv line. First cost is lower than with oil circuit breakers **(p 76)** . . . El Paso Electric Co microwave system, using passive reflectors, proves reliable and economical, eliminates receiving-station towers **(p 60)** . . . Automated fly-ash handling at Public Service E&G facilitates selling it **(p 58).**

PROCUREMENT & PRODUCTS ▶ **Good materials control can help keep your company efficient** and economically sound, says Consumers Power Co's W. B. McClelland

Politics and Public Power

BENSON, HIS BANK, AND SENATE BLASTS

Agriculture Secy Ezra T. Benson, easily the most maligned Cabinet member until the advent of Adm Lewis Strauss at Commerce, has again drawn Senate blasts—and this time, from both sides of the aisle.

Benson recently suggested that it is time to start weaning rural electric and telephone cooperatives away from 2% federal money. The rural co-op movement, as is well known, possesses considerable political muscle, so it surprised no one when Benson's suggestion was greeted with cries of outrage. Co-op defenders leaped forward, reiterating the doctrine of status quo in the Rural Electrification Administration. Benson, by suggesting that the co-ops have their own bank, was threatening the entire movement with emasculation. That, at least, was the tenor of the criticisms.

As for the question of whether, indeed, Benson wants to emasculate REA, look at what he actually said in a May 21 speech at Cedar Rapids, Iowa:

". . . Decisions about the future of the rural electrification and telephone programs need to be made. These are important programs, far too important for their future to be decided in terms of political expediency.

"I have a proposal for a permanent financing plan . . . Here it is:

"1. Authorize these systems to have their own bank—their own lending institution—which they may operate and ultimately own entirely.

"2. Let them have their own national policy board to direct the affairs of their bank. Members of this board would be nominated by the rural electric and telephone borrowers. Plans for reorganizing and operating the REA bank

(p 80) . . . The key to improving buying-stores relations is effective communications, reports Cleveland Electric's C. L. McCamey (p 82).

MANUFACTURERS ▶ **Westinghouse readies rotor for Con Edison's A-plant** at Indian Point . . . Anderson Electric Corp custom builds 16-in. OD flexible connector for main generator leads . . . Pennsylvania Transformer ships 315-Mva unit—the largest it has ever made (p 84).

NEW EQUIPMENT ▶ **Magnetic repeater replaces six conventional isolating amplifiers** in automatic control . . . Compression T-taps can be applied with any compression tool . . . Brushless generator, designed to eliminate sparking, is now available (p 94).

MANAGEMENT ▶ **The roughest test of a utility's public relations program** is the storm which knocks customers out of service. Here as some tips on what the public relations department can do while the lines are down (p 103) . . . Last fall, freshman engineering enrollment declined for the first time in eight years. College deans tell why (p 105).

SELLING ▶ **Iowa P&L's Dean Barnhizer develops a "Lite-Kit"** which makes it easier for salesmen to plan, visualize lighting layouts (p 108).

should be carefully developed to meet the particular capital requirements of the electric and telephone borrowers."

To revert for just a moment, it must be noted that the REA program of 2% federal loans (out of money that the Treasury borrows at 4%) is not going to be emasculated, or, for that matter, even gored.

Long-time co-op supporter, Republican Senator George Aiken from Vermont and a senior member of the Agriculture Committee, hastened to the Senate floor to belabor Benson. Quote Aiken: The Benson proposal would "put (co-ops) still more under the thumb of giant banking and other corporate interests" and "would force possibly one-third of the REA cooperatives to give up the ghost and sell out to utility interests."

And from across the aisle, Senate Democratic Majority Leader Lyndon Johnson of Texas congratulated Aiken and solemnly assured one and all that he, too, felt "shock" over Benson's proposal.

So it goes in Washington as spring nears its end and summer draws nigh.

Two further items should be taken into account, perhaps as footnotes:

1. Four days after Aiken talked about putting co-ops at "still further disadvantage . . . in (the) competitive economy," Consolidated Edison Co offered for public sale $75 million of 30-year first mortgage bonds. The rate: 5.05%.

2. Benson, his survival powers intact, flew unruffled to the West Coast to greet Indonesian Premier Sukarno for Eisenhower.

Benson, no novice at politics, stands on his assertion that most REA co-ops and their officials can—and should—pay their own way, and would if asked by Congress.

Executive Reader

Thermoelectric power generation can supply small and intermediate loads simply and competitively. Boasting efficiencies becoming competitive with all but the large, modern central stations, it is likely to be a useful peaking complement to central station power. Thermoelectric refrigeration may become a significant part of power demand within 18 months. **John C. R. Kelly, Jr, Westinghouse Research Laboratories, Pittsburgh, Pa.**

Three proposed standards are listed in initial recommendations of the EEI-NEMA joint committee on higher secondary and utilization voltages. If the utilities prefer 240/416 v, three phase over 240/480 v, single phase, then the industry will end up with two higher-voltage three-phase standards, because industrial customers prefer 265/460 v, three phase. Let's face it and give both three-phase standards equal status. **H. E. Campbell, Distribution, April 1959.**

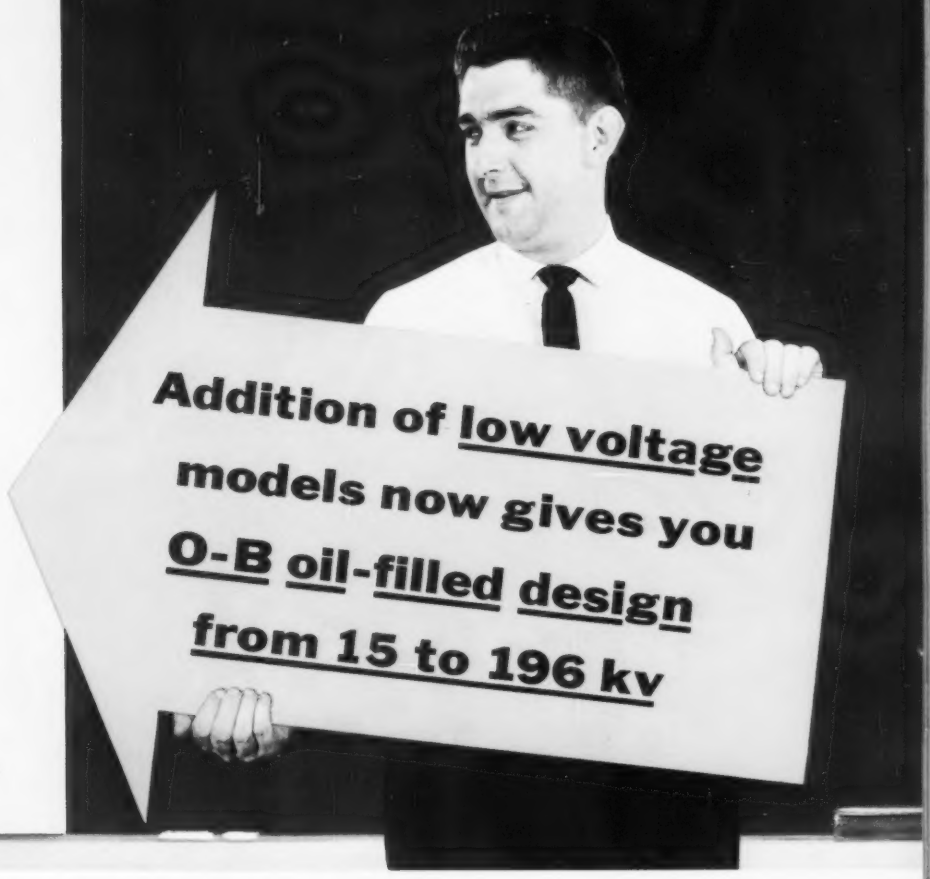
Fluoride coatings provide extra-high temperature insulation on copper, aluminum and other metallic wires while retaining flexibility and freedom from porosity. Fluoride coatings should be satisfactory almost to the melting point of the conductor, report Drs. Steward S. Flaschen and Paul D. Garn, inventors of the process. Aluminum fluoride films show excellent oxidation resistance above 600 C, and do not break down at 450 v at 500 C. **Bell Telephone Laboratories, New York, N. Y.**

Planning of R/W maintenance and brush control programs by management requires a knowledge of costs, chemicals available and their effectiveness, and use of mechanical equipment. These factors are covered in a bulletin which combines information from electric utilities, research agencies, manufacturers, and industry representatives. Compared in detail are brush control methods based on hand cutting, use of chemicals, and mechanical clearing. **Brush Control Practices for R/W Maintenance, Bulletin 161-17, REA, Dept of Agriculture, Washington 25, D. C.**

NUCLEAR NOTES

Progress chart of vital statistics of 34 U.S. Nuclear Power Projects is distinguished from similar charts in that it lists major industrial participants involved in the 26 US and 8 foreign projects for which detailed information is given. Project data, current to March 15, is broken down according to projects in operation, under construction under pre-construction development, under contract negotiation, planned and plans announced. **Atomic Industrial Forum.**

New O-B "Table 2" Bushings Are Ready



* SEE TABLE 2, ASA BUSHING STANDARD C76.1a-1958.

O-B's new ASA Standard "Table 2" interchangeable bushings, *of oil-filled construction,* are now available in all lower voltage ratings.

An additional 15-kv model has also been included. This falls below the range of the present standard.

Today, you can specify Class GK oil-filled O-B condenser bushings, for transformers or circuit breakers, all the way from 15 to 196 kv.

The finest bushing we have made in 50 years is now ready for you at any popular voltage. Please see the following pages for more information.

OHIO BRASS COMPANY, MANSFIELD, OHIO

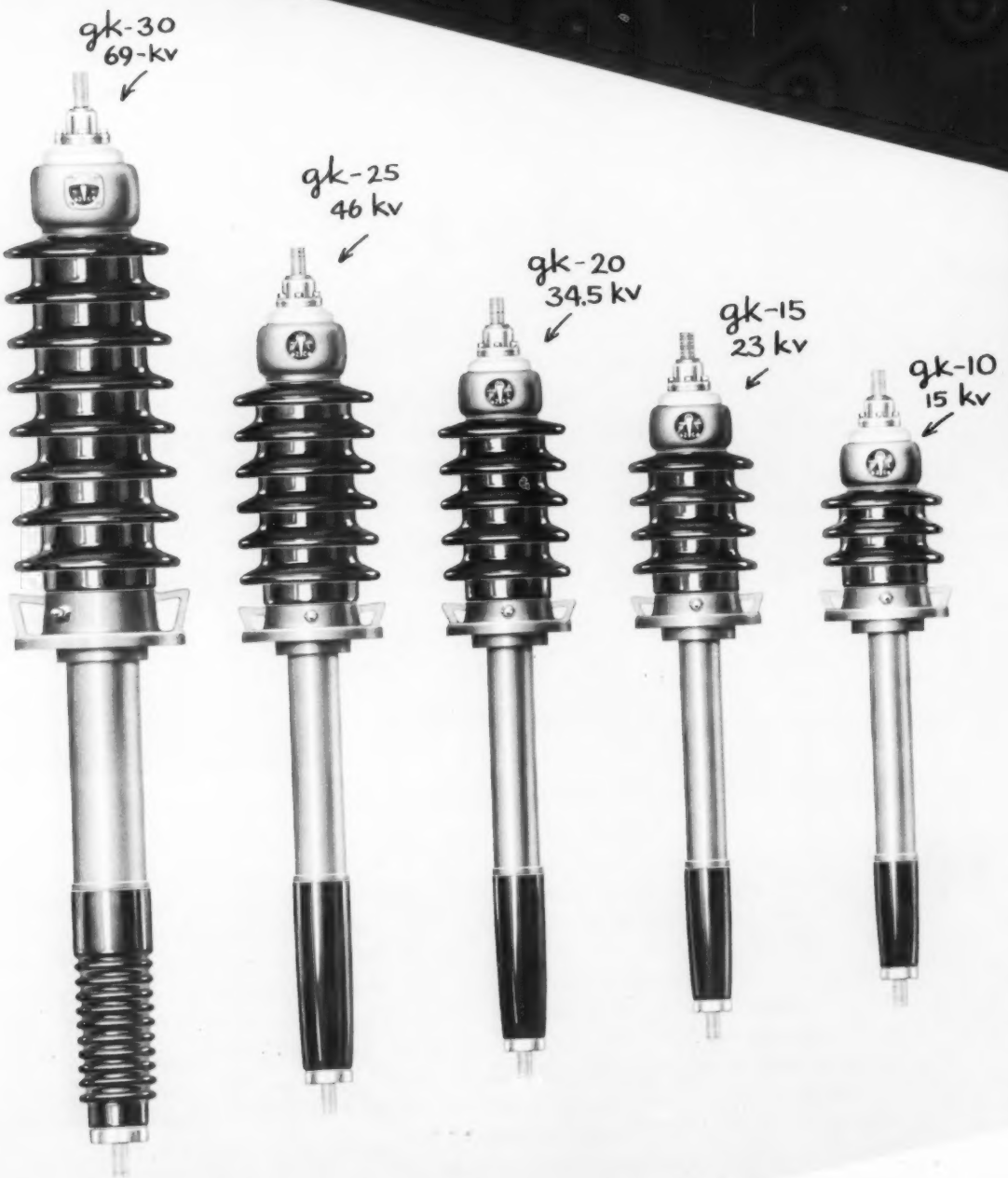
Ohio Brass

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

HOLAN

4938-H1

New Oil-Filled Bushings R



Retain All O-B Features

Just refer to ASA Standard C76.1a-1958, Table 2. This completely covers the details of O-B's new line of oil-filled condenser bushings.

For convenience, one extra model has been added below the range of the standard — a 15-kv class. It follows the intent of the standard in all respects.

Core construction consists of oil-impregnated paper contained within an oil-tight housing with full oil circulation from end to end. Other customary Class GK features include: Full compression assembly with long-amplitude coil springs. Magnetic oil level gauge that prevents any exposure of oil to sunlight. Individual complete electrical testing, covering all standard requirements as well as O-B's own special inspection tests. Exceptional freedom from corona or radio noise.

Your apparatus builder can supply new "Table 2" O-B condenser bushings on any equipment you order. It takes just a word to put O-B dependability into your stations — no extra cost or no extra trouble. Merely express your preference.

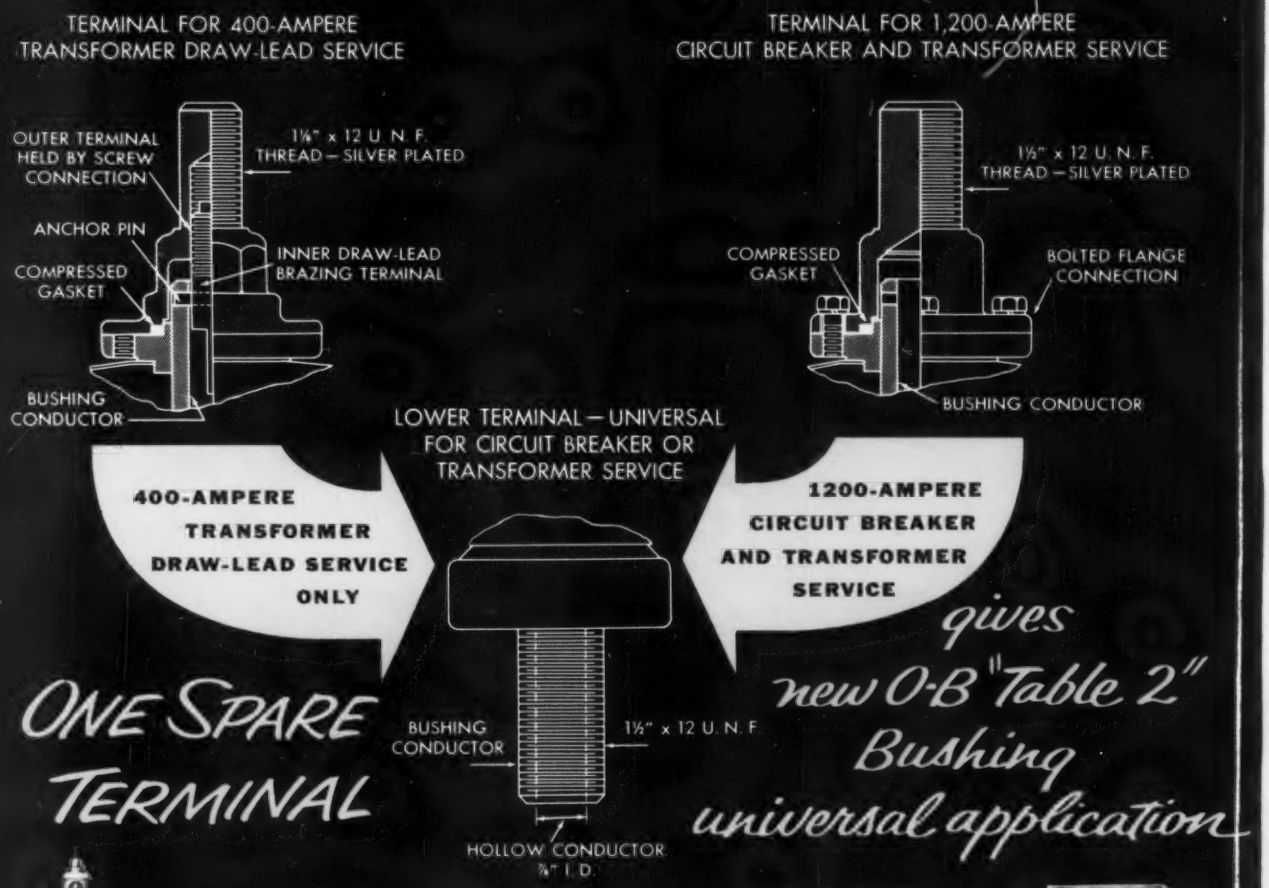
OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4938-H23

Complete Interchangeability


TERMINAL FOR 400-AMPERE TRANSFORMER DRAW-LEAD SERVICE
TERMINAL FOR 1,200-AMPERE CIRCUIT BREAKER AND TRANSFORMER SERVICE
OUTER TERMINAL HELD BY SCREW CONNECTION
1¼" x 12 U. N. F. THREAD – SILVER PLATED
ANCHOR PIN
INNER DRAW-LEAD BRAZING TERMINAL
COMPRESSED GASKET
BUSHING CONDUCTOR
1¼" x 12 U. N. F. THREAD – SILVER PLATED
COMPRESSED GASKET
BOLTED FLANGE CONNECTION
BUSHING CONDUCTOR
LOWER TERMINAL – UNIVERSAL FOR CIRCUIT BREAKER OR TRANSFORMER SERVICE
400-AMPERE TRANSFORMER DRAW-LEAD SERVICE ONLY
1200-AMPERE CIRCUIT BREAKER AND TRANSFORMER SERVICE
BUSHING CONDUCTOR
1¼" x 12 U. N. F.
HOLLOW CONDUCTOR ⅞" I. D.

ONE SPARE TERMINAL *gives new O-B "Table 2" Bushing universal application*

Stock just one spare terminal, and you have complete bushing interchangeability. New "Table 2" O-B oil-filled condenser bushings for 69 kv and below employ hollow conductors, suitable for 1,200-ampere circuit breaker or transformer currents, and allowing passage of a 400-ampere transformer draw-lead.

Lower ends are universal. No change is needed for any type of service, and corona shields are not generally used.

Top construction consists of a 1,200-ampere terminal, or a 400-ampere draw-lead terminal that is interchangeable. One bushing and a spare terminal will cover every emergency requirement at a given voltage.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

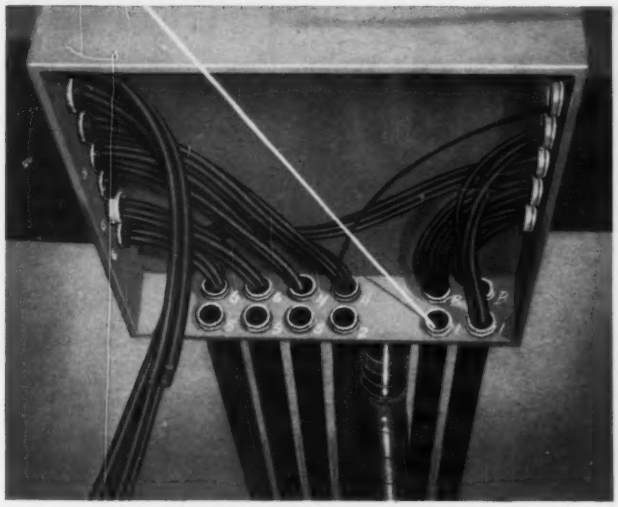
Over two years of intensive development have been expended on the new line of O-B oil-filled condenser bushings, to provide ample mechanical and electrical strength within the standard dimensions below the flange line.

At O-B's entry into the condenser bushing market a few year's ago, a complete new factory was built and equipped for this special purpose. These fine manufacturing facilities are now being applied to the new "Table 2" O-B low voltage oil-filled bushings.

Now you have traditional O-B dependability across the board! Simply state your preference when new apparatus orders are placed.

4938-

To meet today's ever increasing power demands...



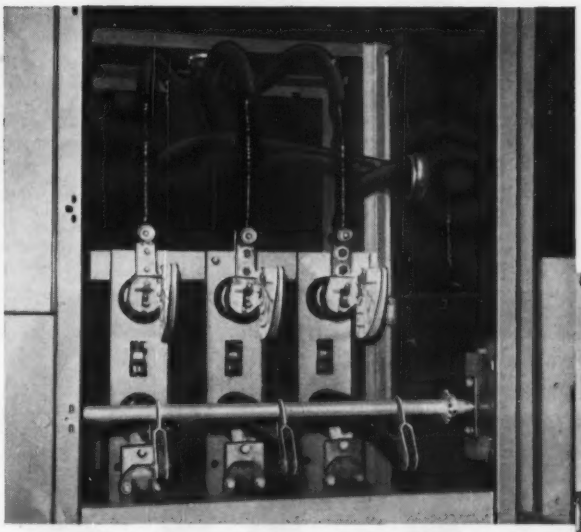
Paranite Paraseal® RHW, Type RR for duct.

IT'S

PARANITE

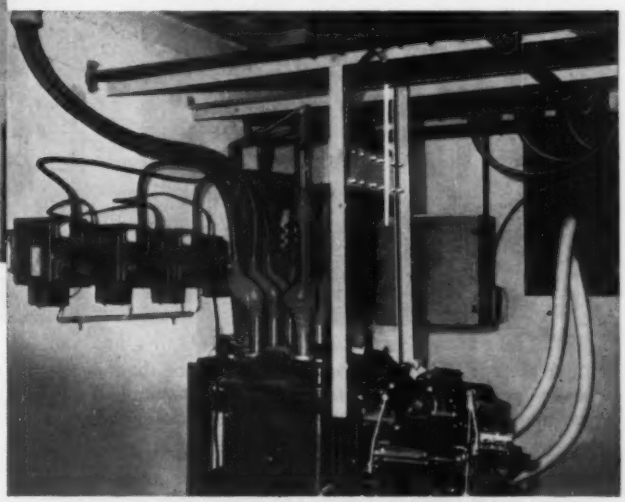
WIRE AND CABLE BEING SPECIFIED

for tomorrow's quality, dependable and trouble-free installations!



Above: Super Parause® RHW, Type RR for direct burial.

Below: Paranite Paraseal® RHW braided, for use in conduit.



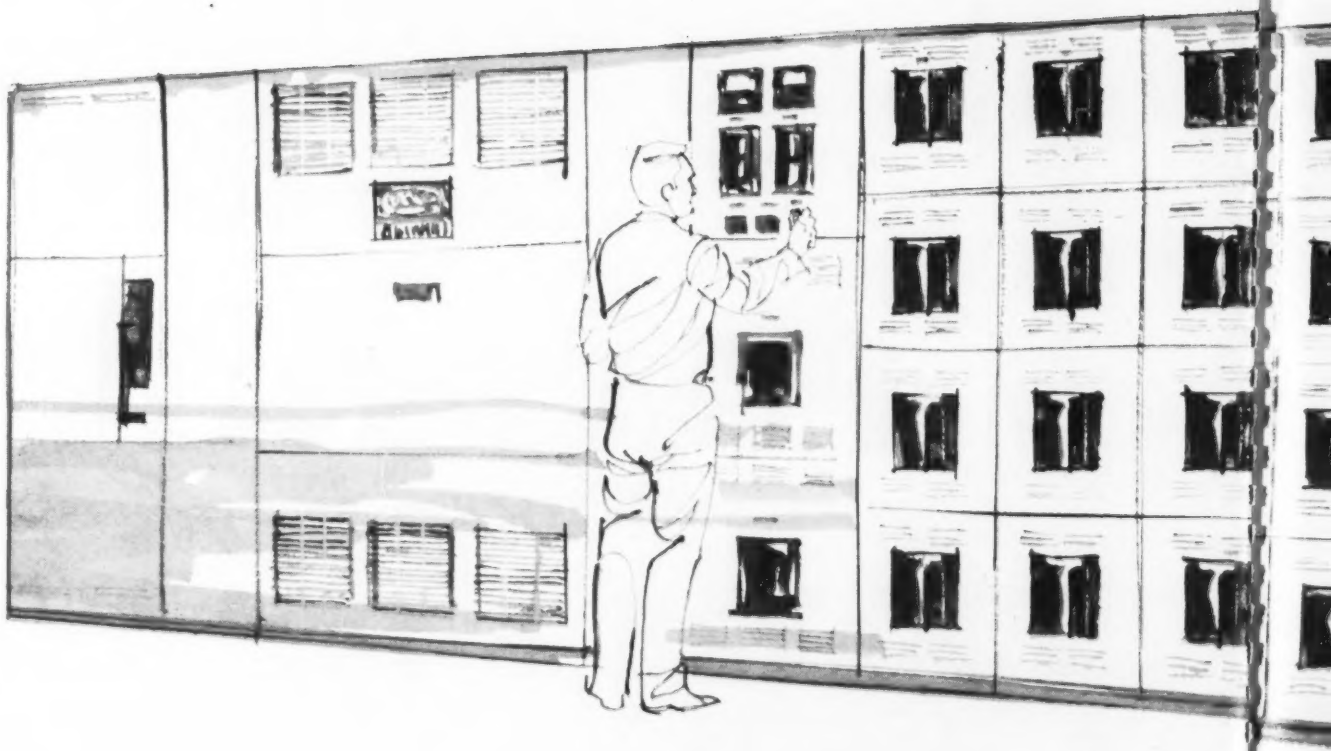
Sales Offices in all principal cities — sold only through Recognized Electrical Distributors

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation

FORT WAYNE, INDIANA

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Birmingham, Ala.; Anaheim, Calif.

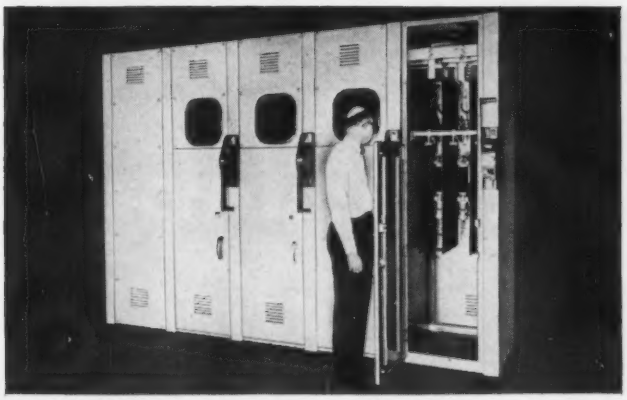


AHEAD

An I-T-E Secondary Unit Substation is more than just a source of power for your central station requirements. It's an investment that puts you years ahead in station equipment.

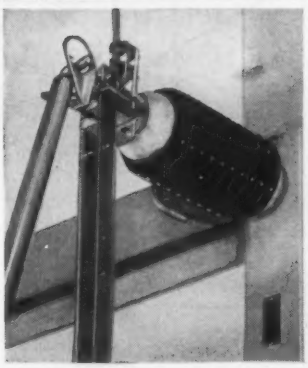
The new I-T-E K-LINE circuit breakers are unmatched for safety, protection and lasting economy. Manual quick-make, extended range trip adjustment, and closed-door disconnect are all combined in a single, compact design. The transformer is built by I-T-E for your own particular application on a basis of fresh engineering ideas original with I-T-E. The I-T-E primary fused interrupter switch or metal-clad circuit breaker closes even into a fault with complete safety for the operator, and the entire substation is assembled and shipped from a single plant . . . you are assured complete coordination, easy assembly, and on-time delivery.

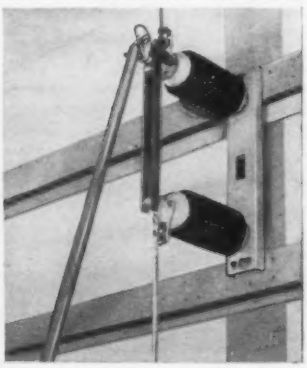
If you want to be ahead in the equipment you buy, look into the broad I-T-E line. Users claim you can't buy better, yet it costs no more.



Safe switching. Yes, there's real economy in fused power switching centers, but make sure you also get the *extra safety* only I-T-E offers. In every I-T-E Power Switching Center, you have the assurance of knowing that switches can be closed *even into a fault* with complete safety for both personnel and equipment. Unique standardized cubicles and building block construction reduce engineering expense (the saving is passed on to you), and also shorten the time between order and delivery. Equipment arrives on the job in sturdy, preassembled units, ready for easy, fast installation.

Disconnect circuit breakers with door closed. I-T-E low-voltage metal-enclosed switchgear gives new operator safety. K-LINE circuit breakers can be moved from connected, through test, all the way to disconnected position without opening door. Overload setting easily adjusted to new load conditions by expanded calibration overcurrent trip device. Manual quick-make affords safer operation and extends contact life. Compact construction permits 4-high mounting of circuit breakers of up to 600 amp rating. K-LINE ratings: 600 v a-c, 250 v d-c, 15-1600 amp continuous.





Hear it snap shut. New I-T-E hook-operated disconnecting switches provide positive indication that they have closed completely. An easily audible "snap" is heard. And extra-large latch members serve as visual assurance. Parallel blades are widely spaced and heavily braced for maximum rigidity. Roomy hook-stick eye and pryout motion in opening contribute to the easy operation of the switch. Ratings: 7.5 through 69 kv, 600 and 1200 amp.

U-3

I-T-E CIRCUIT BREAKER COMPANY
1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Secondary unit substations
- ☐ Power switching centers
- ☐ K-LINE circuit breakers
- ☐ Hook-operated disconnect switches
- ☐ Isolated phase bus
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)
- ☐ Reclosers
- ☐ Primary unit substations
- ☐ Other

Name..... Title.....
Company.....
Street.....
City..... Zone.... State.....

SEND COUPON OR WRITE

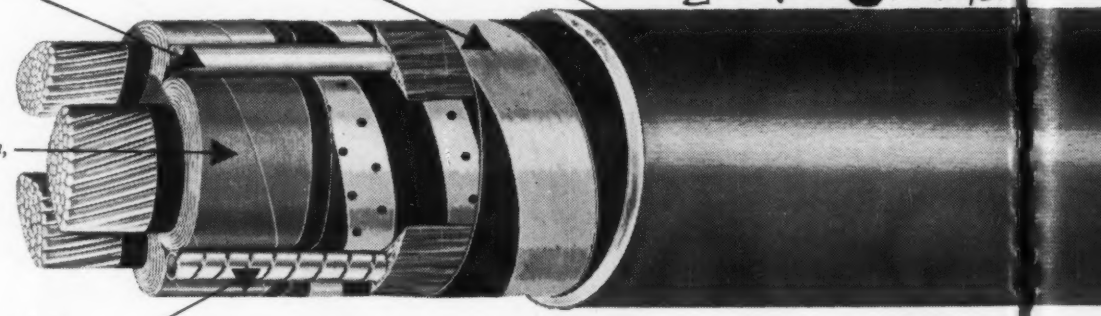
Get complete, up-to-date information on I-T-E equipment.

I-T-E CIRCUIT BREAKER COMPANY

Non-magnetic shielding tape over cable core.

Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion, has outstanding heat stability.

Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.



Impregnated paper insulation, with shielding.

Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.

ROEBLING GAS-FILLED CABLE

gives "no-outage" service ...without relying on luck!

THE SHEATH ON THIS CABLE . . . is one more reason why it's a best buy! The Tellurium-Lead Alloy Sheath offers the best possible resistance to fatigue and age-hardening problems . . . has 90% less creep, 4½ times greater bending life!

SIMPLE TO SPLICE—Roebling Gas-Filled Cable actually is as easy to splice as ordinary paper power cable.

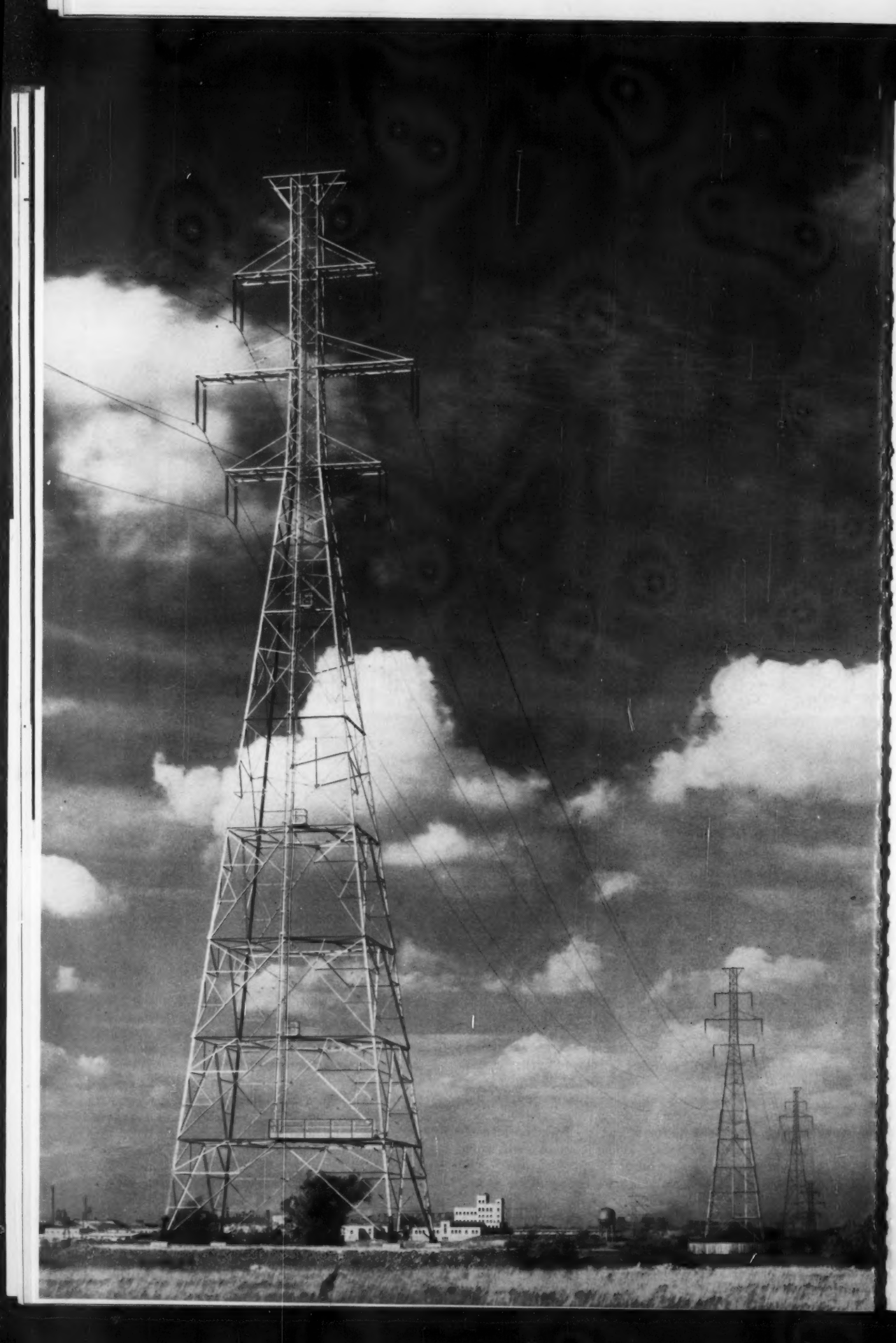
How? Because it virtually can "look after itself!" This remarkable cable is self-supervisory. Inside it, super-dry nitrogen gas is present at approximately 12 p.s.i. pressure. When pressure drops below 10 p.s.i.—or goes above 16 p.s.i.—a "trouble" message is relayed to the nearest attended station. Because you know *immediately* when something's up, repairs can be made before further, and perhaps more serious damage occurs! What's more, should small holes develop in the splices or elsewhere, escaping gas *prevents* the entrance of killing moisture until there's opportunity to repair the cable!

ROEBLING GAS-FILLED CABLE, for voltages up to 46 kv, offers other advantages, also. The inert dry nitrogen gas provides consistent dielectric properties throughout the cable's length. It prevents ionization, too. This Roebling Cable is as easy to splice as solid-type paper power cable —and if your system's profile includes grades, it will prove the most inexpensive cable you've ever specified!

Our new Gas-Filled Cable book soon will be ready. It tells you the fine points of this wonderful cable . . . and its applications. Write for it today! Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation



A
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PHO

A 1958 addition to the Niagara Mohawk Power Corp. transmission system is this 230 kv double-circuit line. Running approximately 15 miles from Huntley generating station to Packard substation, it includes two crossings over the Niagara River. At the upper crossing, the line spans 1812 feet between two 300-foot towers. The lower river crossing, shown here, is on three 265-foot suspension towers, making the crossing in two 1880-foot spans. Conductor is 1,158.4 MCM ACSR. Double strings of 26 short-spaced suspension discs support conductors on the top two arms. 24 discs in double strings carry lowest conductors. Three ground wires are used, each 7/16" stainless steel. Lapp suspension insulators included in this installation are No. 8201, 10" diameter 15,000-lb. ball-and-socket, 5" spaced.

PHOTO BY APPLETON

230 kv RIVER CROSSING USES 26-UNIT STRINGS ON TALL TOWERS FOR EXTRA LIGHTNING PROTECTION

It requires a total of 912 suspension insulator units to support these six conductors as they cross the three-quarters of a mile width of the Niagara River. 912 insulators, every one of which individually must carry responsibility for the security of the line. Service records of power companies the world over prove the wisdom of relying on Lapp suspension insulators. Soundness of design . . . advanced techniques of porcelain manufacture and assembly . . . tight uniformity of test characteristics . . . all add up to the fact that lines on Lapp insulators start with an *extra* margin of long life and operating security. For your new subtransmission, transmission and EHV lines, you too can rely on the specification of Lapp insulators.

Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

Dallas' NEW SOUTHLAND CENTER

supplied with 12,000 kva of electricity

Served by six Wagner Underground Network Transformers

Transformers Dallas' fabulous new Southland Center consists of the 42-story Southland Life Tower, tallest building west of the Mississippi, and the 600-room Sheraton-Dallas Hotel. A "City within a City," the Southland Center is an enormous consumer of electric power. For example, there is a 6,450 ton electrically-driven air conditioning system—fourth largest in the world!

Dallas Power and Light Company, who supplies this power, has installed six 2,000 kva underground network transformers in the basement of the building to assure continuous electrical service to the Center. The transformers were supplied by Wagner.

Wagner Network Transformers are built for installations of this type. They have a low noise level . . . they are small in size to fit in close quarters, and now have a compact switch and panel radiators for smoother contour and easier maintenance.

Wagner makes a complete range of transformers for industrial and power company needs. Consult your nearby Wagner Sales Engineer about your power distribution program. There are Wagner branches in 32 principal cities.

Southland Center has 296 miles of electrical wiring . . . 15,800 lighting fixtures . . . 28 elevators . . . 8 escalators and an all-electric company cafeteria.

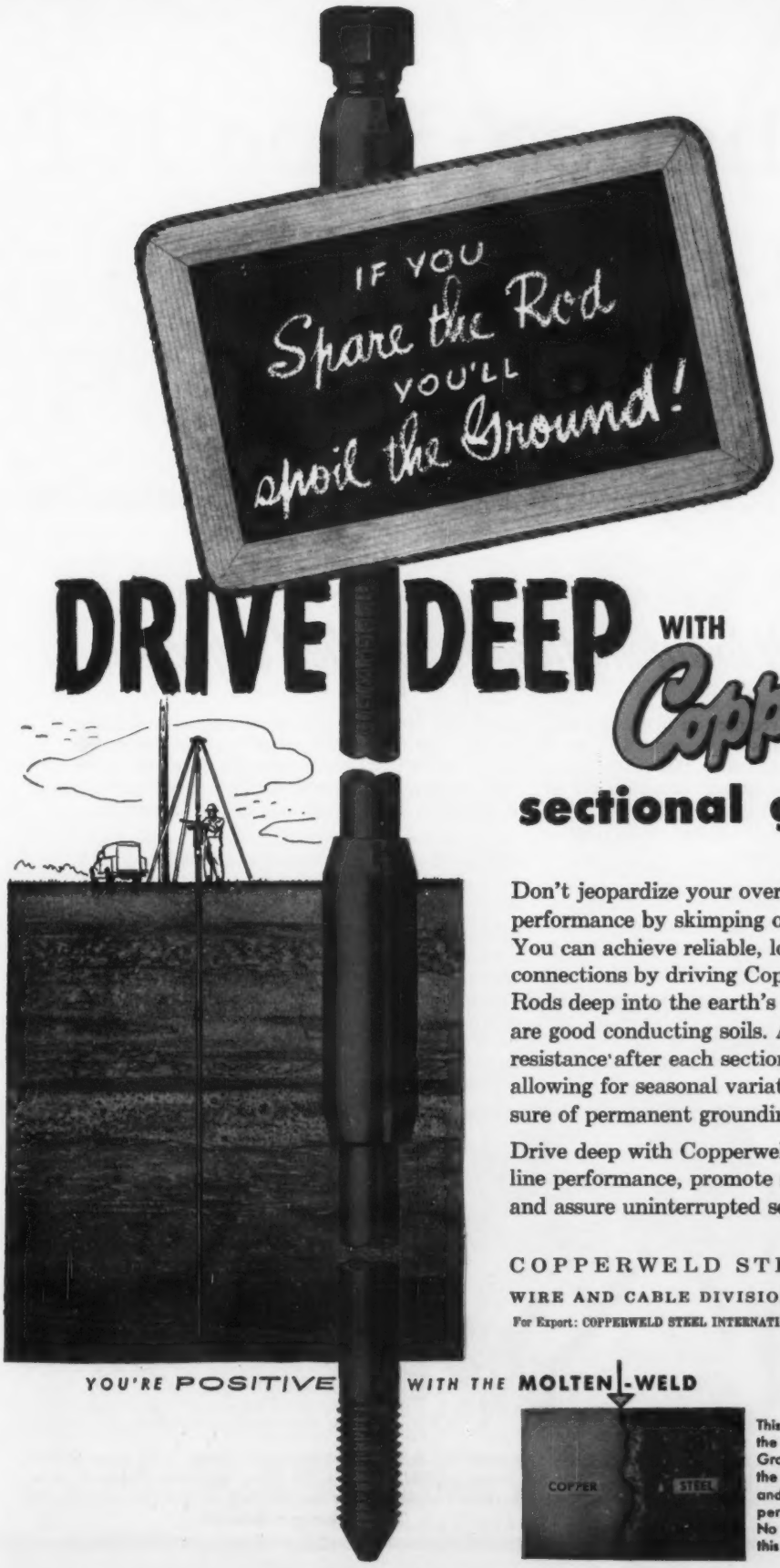
WT59-11

SERVING 2 GREAT GROWTH INDUSTRIES . . .
ELECTRICAL . . . AUTOMOTIVE

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES



DRIVE DEEP WITH Copperweld®

sectional ground rods

Don't jeopardize your overhead line performance by skimping on ground rods. You can achieve reliable, low-resistance ground connections by driving Copperweld Sectional Ground Rods deep into the earth's sub-surface where there are good conducting soils. And by measuring resistance after each sectional rod is driven—allowing for seasonal variation—you can make sure of permanent grounding protection.

Drive deep with Copperweld! You'll improve line performance, promote safety, avoid damage, and assure uninterrupted service.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

YOU'RE POSITIVE WITH THE MOLTEN-WELD

This microphotograph of the weld area of Copperweld Ground Rods shows how the grains of copper and steel alloy to form a permanent, continuous weld. No other process achieves this inseparable union.

New Chance Type RT REGULATOR BY-PASS SWITCH

meets All NEMA requirements for SPST hookstick

Does the work of 3 SPST switches

and does it in automatically controlled sequence

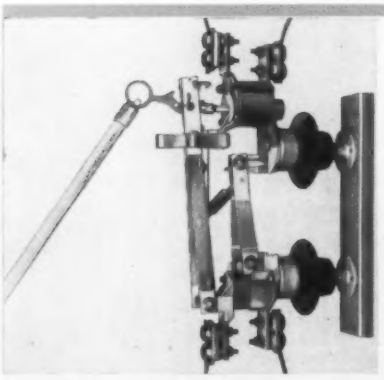
All the switching steps required in by-passing and isolating voltage regulators are performed in automatically controlled sequence by this new Chance Type RT Switch. This single unit does the work of three SPST hookstick switches in (1) by-passing the regulator (2) disconnecting both leads and (3) interrupting the exciting currents.

The Chance RT Switch has been designed to meet *all* NEMA standards applicable to the SPST hookstick switches, including all short time current ratings. Thus, you have the security of full NEMA ratings, plus simplified and completely controlled operation.

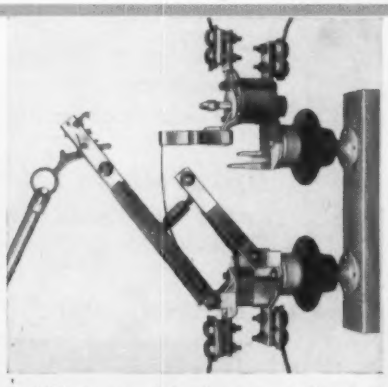
Outstanding performance features of this new design are its ruggedness and its ability to withstand the mechanical and thermal shocks of high current surges. The blade-over-blade design eliminates eccentric forces on spacer insulators. Epoxy resin gives resiliency to the attachment of studs in the spacer insulators to resist the mechanical shock of slam-bang operation or heavy faults. Contact engagement is secure in both closed and by-passed positions.

These disconnects cannot be opened under load, because blades cannot move to open position until the regulator has been by-passed . . . and the recloser cannot be left by-passed in reclosing.

Chance Type RT Switches are more economical . . . are easier to install . . . more reliable, less hazardous and require less space than a comparable installation of single-throw disconnects. They can be used with all regulators that can be set in neutral for switching. Ask your Chance Representative, or write for Bulletin 280 for full information.



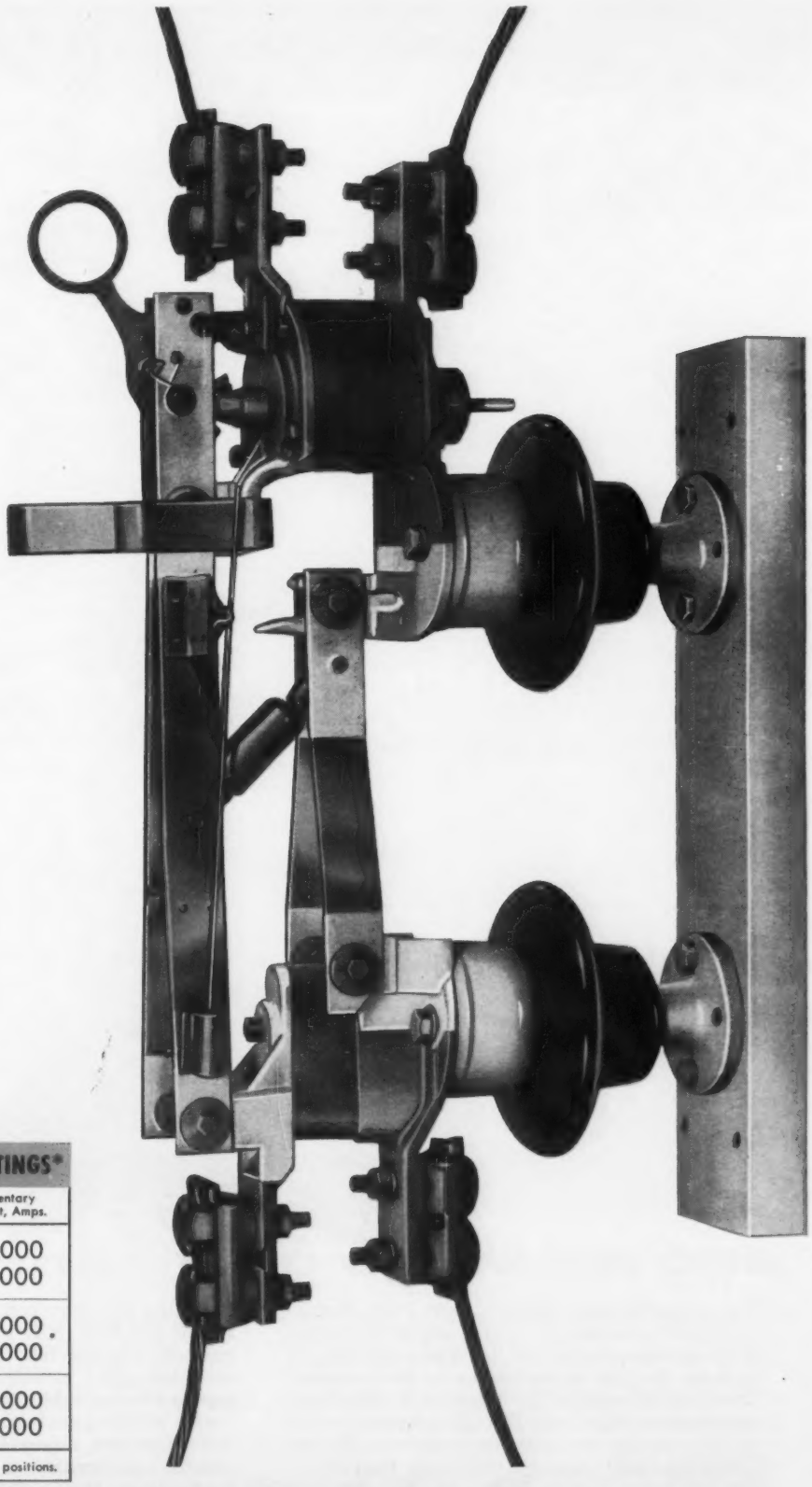
1. A pull on the ring disengages the blade latch—pulls the shunt bar into by-pass position between the shunt contacts (housed in the upper spacer insulator).



2. With the regulator by-passed, the dual blade continues downward travel, opening both disconnects. Arcing horn still maintains contact.

3. As the blade moves to full open position, snap-out arcing horn whips open to interrupt the exciting current. In reclosing, the sequence is reversed.

switches



CHANCE TYPE RT SWITCH RATINGS*

Voltage	Continuous Current, Amps.	Momentary Current, Amps.
7.5 KV	400 600	20,000 40,000
15 KV	400 600	20,000 40,000
23 KV	400 600	20,000 40,000

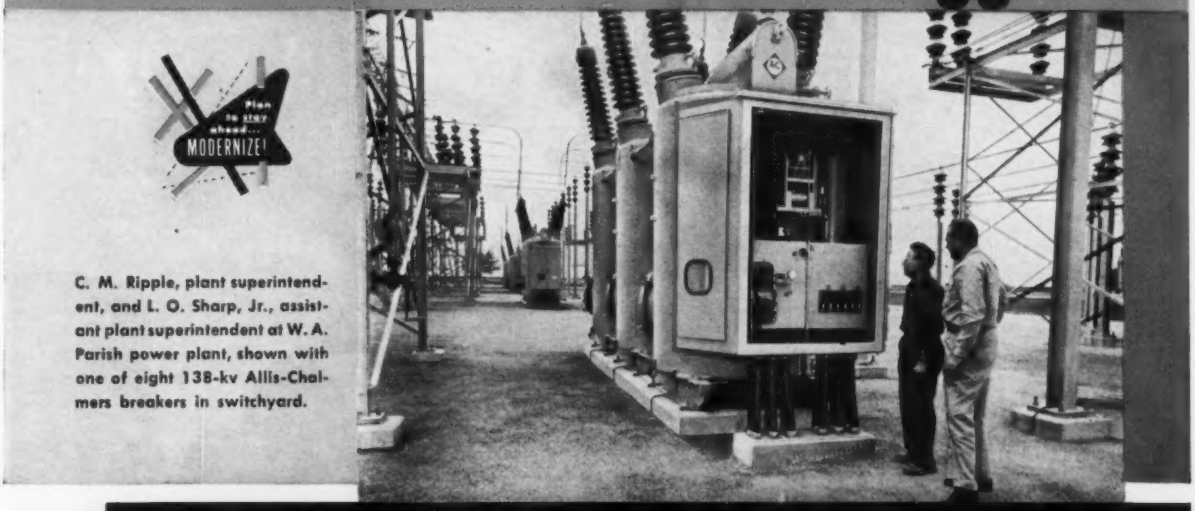
*Ratings apply to both closed and by-passed positions.

A. B. CHANCE COMPANY CENTRALIA, MISSOURI

A. B. CHANCE CO., Ltd. of Canada

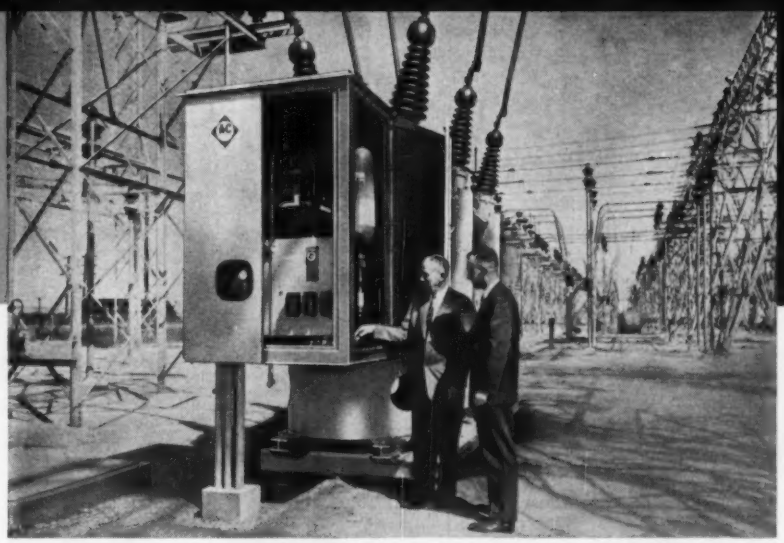
CS59-7

ALLIS-CHALMERS modern line for '59



C. M. Ripple, plant superintendent, and L. O. Sharp, Jr., assistant plant superintendent at W. A. Parish power plant, shown with one of eight 138-kv Allis-Chalmers breakers in switchyard.

Look at the record at Houston Lighting & Power Company



H. C. Tayler, electrical supervisor Power Department, and A-C's J. O. Higgins in Deepwater power plant switchyard.

Ten Allis-Chalmers breakers with *Pneu-Draulic* operators have been in service nearly five years. Eight additional units installed a year ago bring to eighteen the total number in use by the company.

In fact, the excellent performance of Allis-Chalmers breakers with *Pneu-Draulic* operators has led to their use on over 100 power systems. Repeat orders have been received from more than 60.

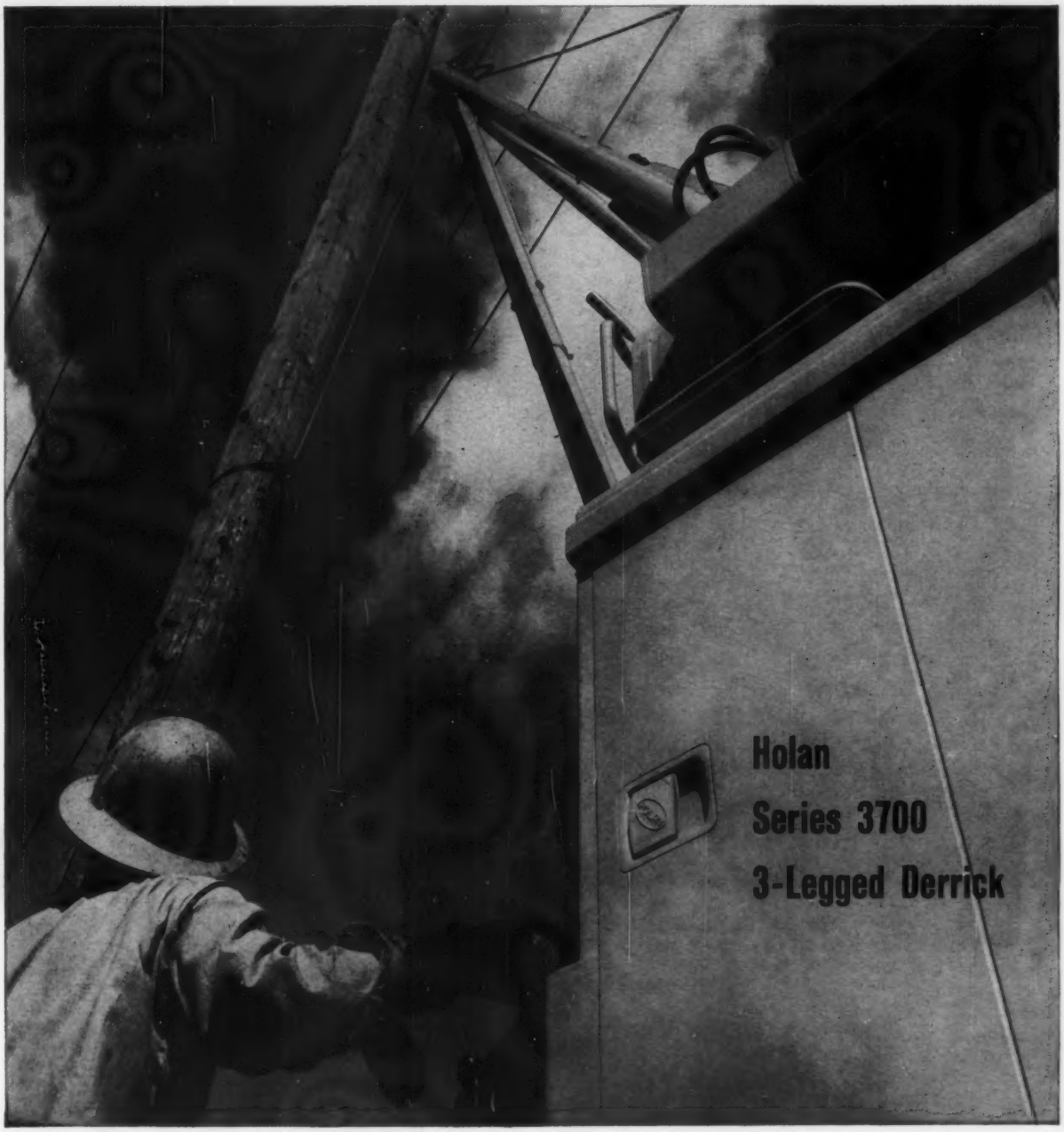
Behind this story is design leadership in power circuit breakers. A-C has led the way to fully mechanically trip-free operation and high speed arc interruption, as well as simplified operator design as represented by the *Pneu-Draulic* operator.

Get details from your nearby A-C office, or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin

Pneu-Draulic is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

A-1035-E



Ask the man who operates one

Second orders for the Holan Series 3700 Derrick are not too difficult. Once a utility uses it in the field, there's no question about the product.

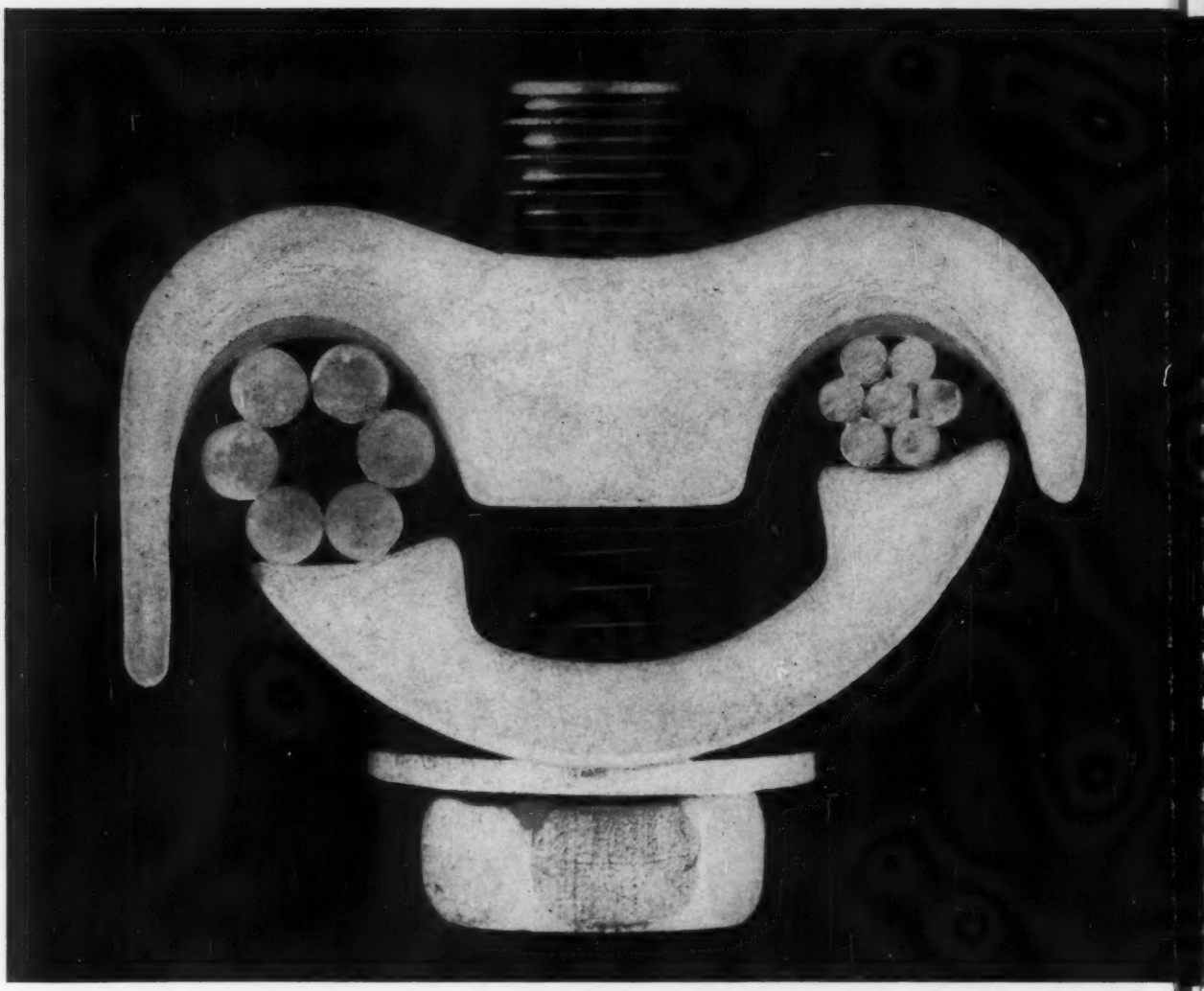
Our specs tell you the 3700 has a 12,000-pound capacity and lifts 75-foot poles. Actually, it's been tested at 22,000 pounds and handles longer poles. It also hoists 5,000 pounds over the rear axle for body-loading and has a 195° operating range. And you have plenty of power for forcing diggers into hard ground.

This derrick has three legs instead of two—an integral middle leg gives extra strength and has you ready for butt-pulling, body-loading, and extra-heavy lifts at a moment's notice.

If you want assurance before you buy, don't ask us. Ask the man who operates one.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan
Subsidiary of THE OHIO BRASS COMPANY



NEW ALCOA CLAMP

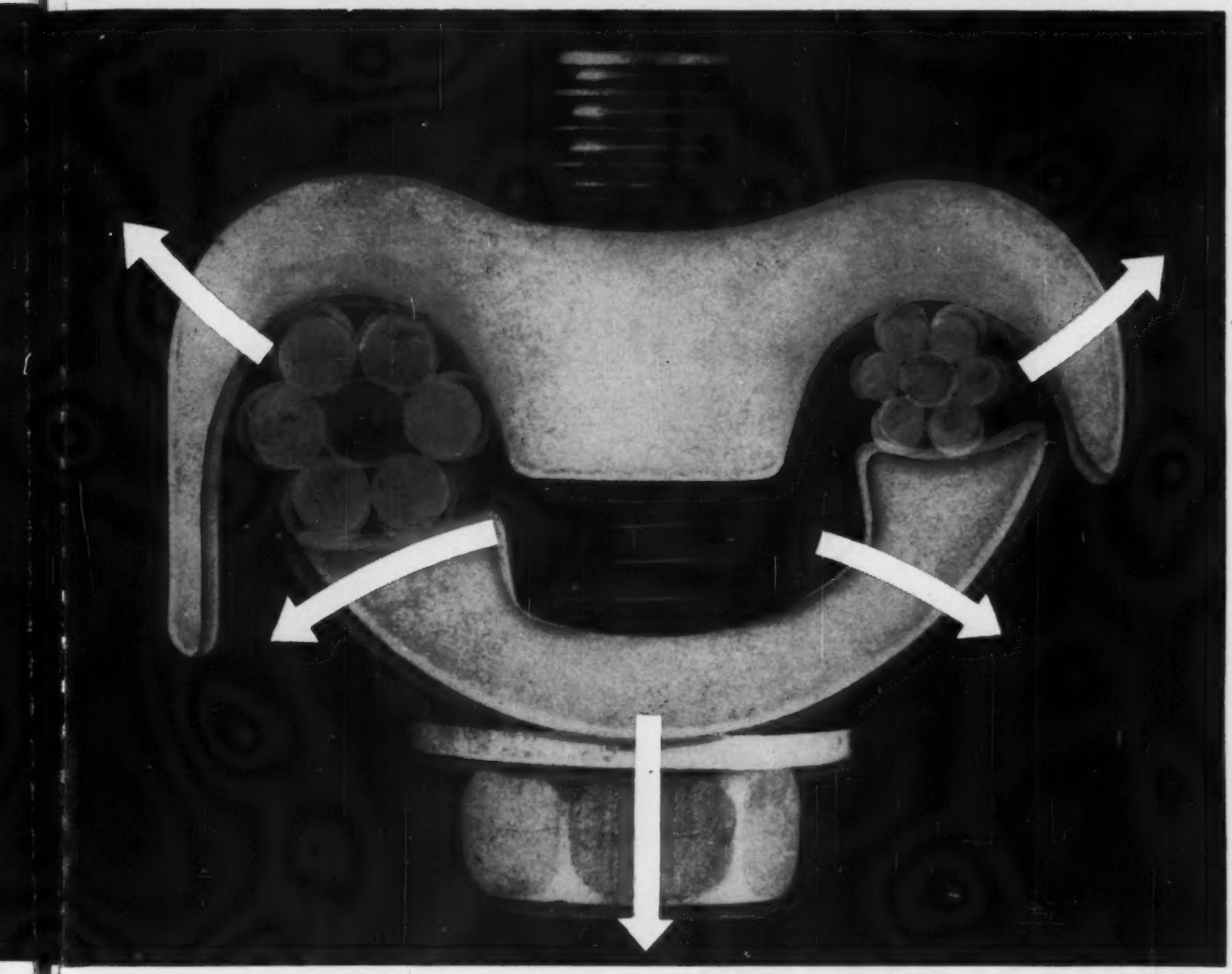
Alcoa Clamps and Connectors Flex with Thermal Changes to Provide Safer, Longer Lasting Connections

Exclusive flexing-action design of Alcoa clamps and connectors gives good conductor contact regardless of thermal changes . . . eliminates the costly problems caused by excessive relaxation.

Here's how this works:

During normal, gradual temperature increases, excess pressure on the conductor is avoided by even expansion throughout the Alcoa clamp. Because Alcoa clamps and connectors are all-aluminum, including the bolt, all components have the same coefficient of expansion.

Alcoa clamps and connectors also adjust during



Above is a pictorial representation of the flexing action Alcoa clamps undergo during thermal changes in conductor. This automatic built-in protection, exclusive with Alcoa clamps and connectors, permits the clamp to "breathe" with changes in pressure.

ACTUALLY "BREATHES"

current surges which cause sudden heating with insufficient time for temperature distribution. In these cases, the flexing action of the spring-like cap member and the stretch action of the aluminum bolt (which is three times that of steel hardware per unit of force) combine to ride with changing mechanical pressures. As cooling occurs, the Alcoa clamp *follows up*, retaining pressure to provide a stable electrical connection.

The entire line of Alcoa extruded clamps and connectors—both light and heavy duty—incorporates this exclusive flexing-action design principle. Why not ask an Alcoa sales engineer to show you what this unique feature can mean to you in terms of safer, longer lasting, maintenance-free installations. Aluminum Company of America, 2110-F Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM

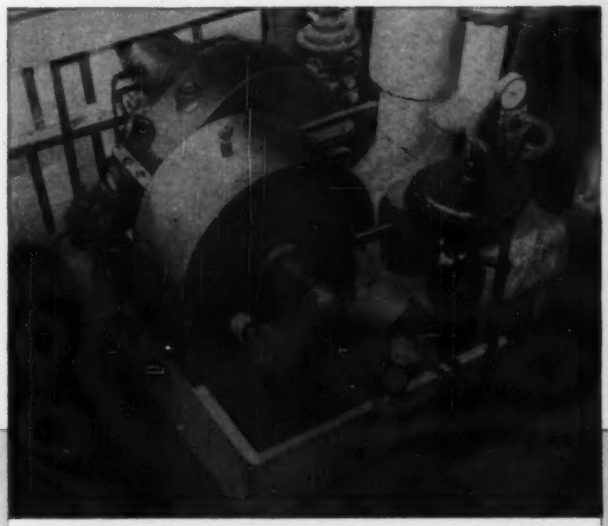
ALUMINUM COMPANY OF AMERICA

For Exciting Drama
Watch "Alcoa Theatre,"
Alternate Mondays, NBC-TV,
and "Alcoa Presents,"
Every Tuesday, ABC-TV

ELLIOTT TURBINES
since nineteen hundred four
MOTORS
since eighteen hundred eighty eight

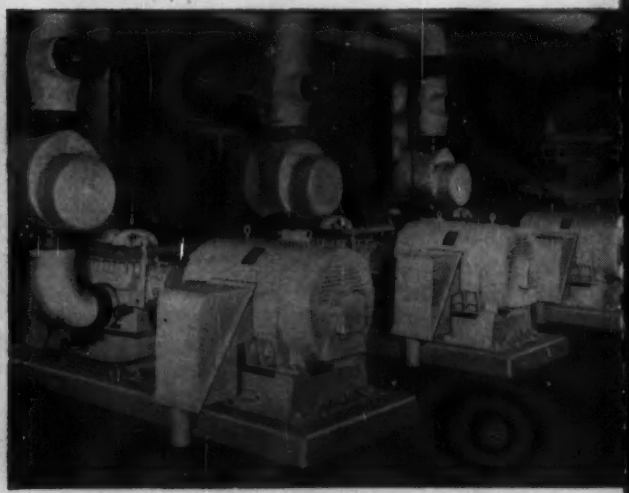
for your auxiliary drives...

Steam or Electric
Large or Small
Indoor or Outdoor



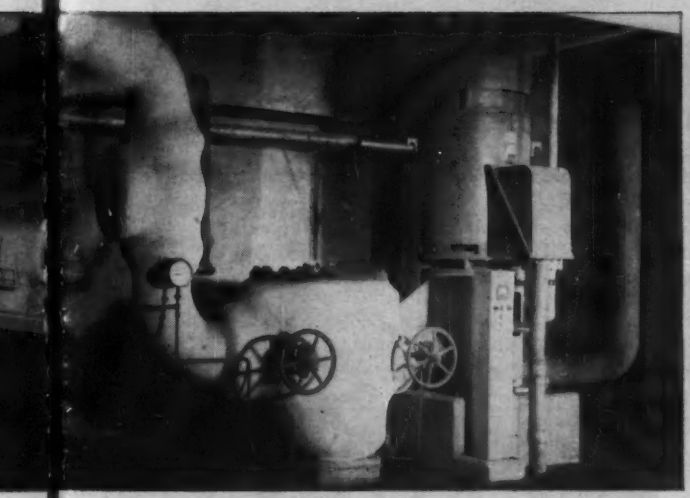
This Elliott geared turbine drives the induced-draft fan serving the 120,000-lb-per-hr boiler for a northeastern pulp mill. Elliott turbines are noted for simplicity, flexibility and year-in and year-out dependability.

ELLIOTT Company
JEANNETTE, PENNSYLVANIA

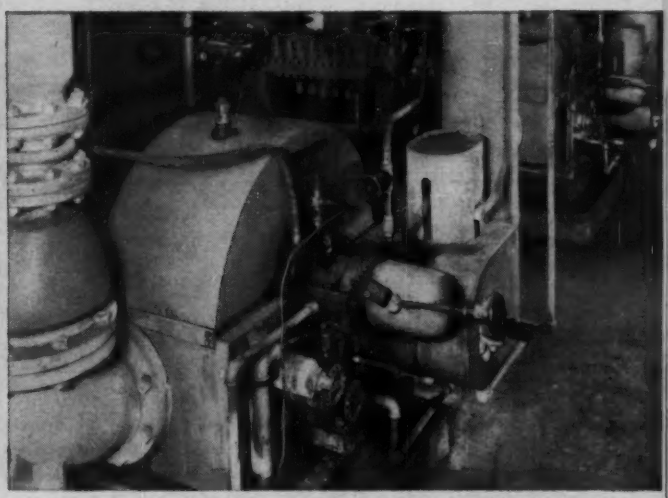


Heater drain pumps are driven by identical 200-hp, 3600-rpm Elliott motors. Elliott water strainers are mounted in pump inlets. Other Elliott products for power plants include condensers, ejectors, deaerating heaters, tube cleaners and expanders.

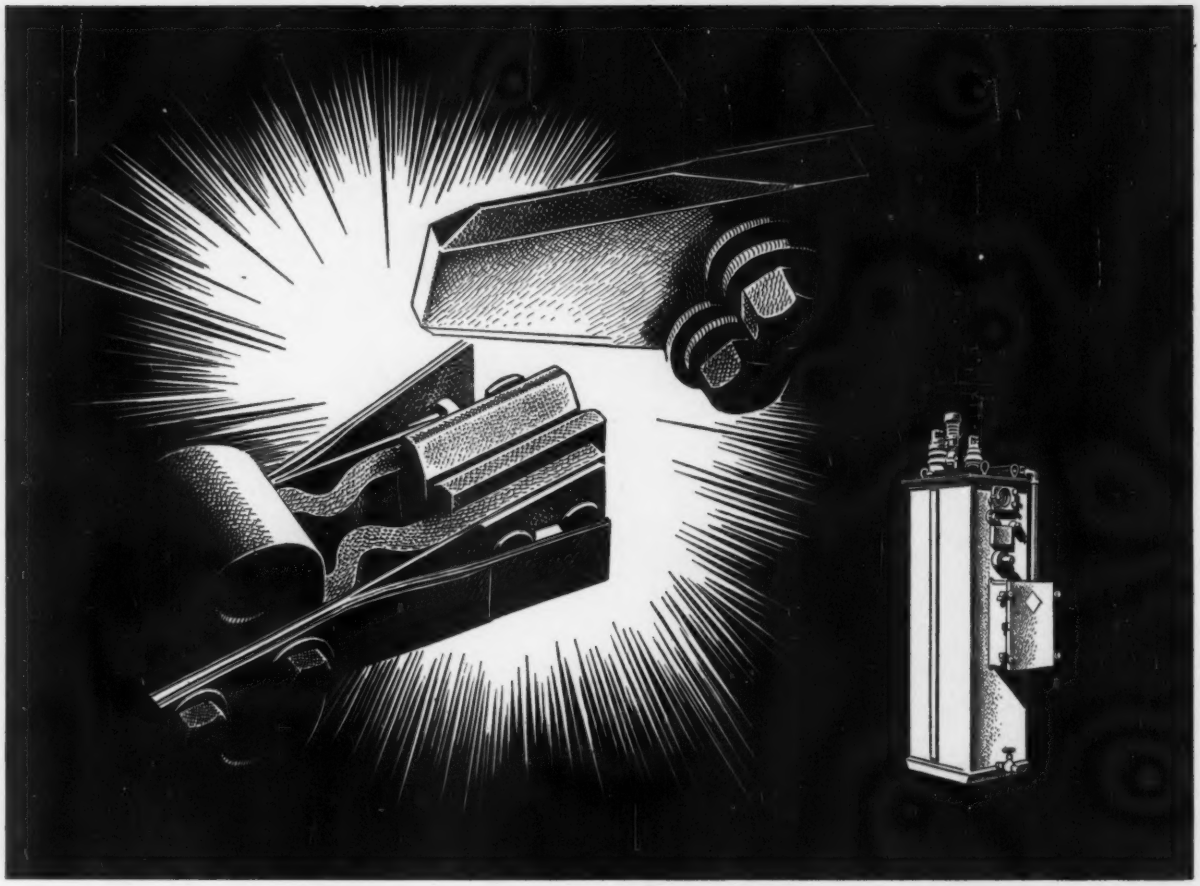
Dripproof 600-hp, 900-rpm Elliott motors driving line of coal pulverizers. Elliott FABRI-STEEL construction assures structural rigidity; FABRI-SEAL insulation assures maximum service life.



Here an Elliott 250-hp vertical, dripproof motor is shown driving a condensate pump. An Elliott twin basket water strainer which protects the pump can be seen at the left. Elliott C-W motor experience dates from 1888.



250-hp, 3550-rpm Elliott turbines drive boiler feeders in this industrial plant. All major auxiliaries in this station are Elliott turbine-driven. For over a half century, Elliott has been building turbines and turbine-generators.



Top Performance Comes "Built-In" When You Specify Mallory Contacts

Contacts play an important role in modern electrical gear such as circuit breakers, motor controllers, and voltage regulators. To be sure of top performance in the equipment you buy, it pays to specify Mallory Elkonite® contacts.

Long experience in the specialized science of contact design and manufacturing goes into Elkonite contacts. The combination of density, hardness, micro-structure, resistance to arc erosion, mechanical strength, and other vital characteristics is selected to match the requirements of each application. The particle size of the refractory constituent and processing technique are carefully controlled to produce the characteristics required by the finished contacts.

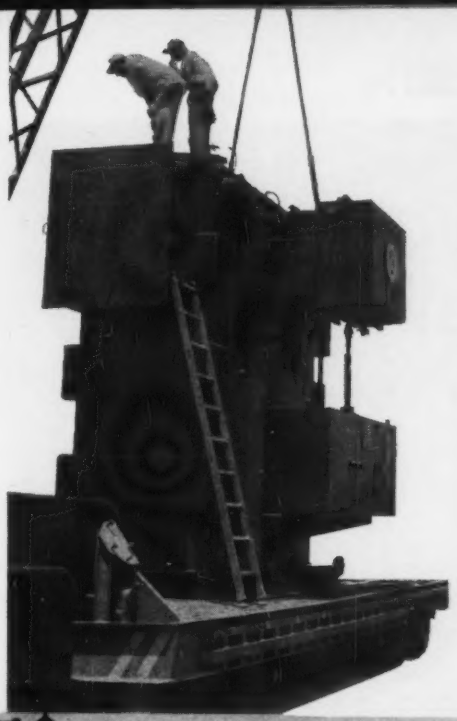
For many years, Mallory has engineered and supplied contacts for leading manufacturers of switchgear. Be sure that the manufacturer from whom you buy uses Mallory Elkonite contacts. They're your assurance of lasting and dependable performance . . . and they're the hallmark of value-minded design.

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Mercury and Zinc-Carbon Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

Expect more . . . get more from

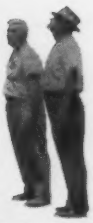
P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA



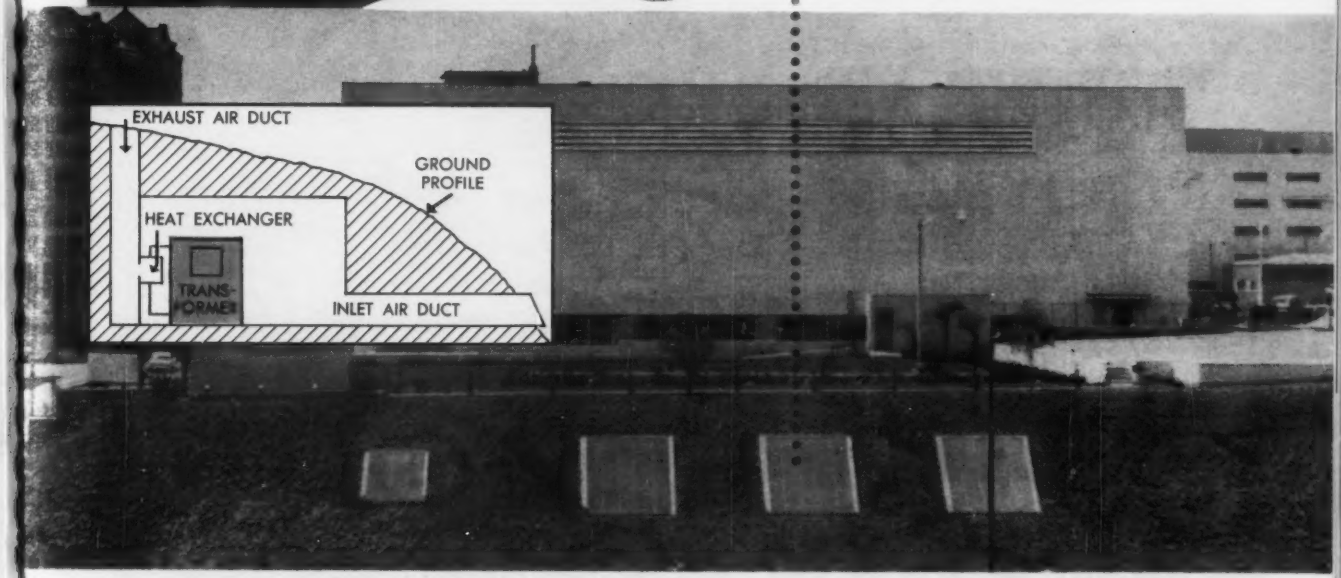
60,000 Kva

of Pennsylvania Transformer Capacity

GOES UNDERGROUND



in Los Angeles distributing station



Special cooling arrangement used in installation of three 20,000-kva load tap changing transformers

A combination of economic and esthetic factors prompted the City of Los Angeles, Department of Water and Power to construct an *underground* distributing station to supply power to the city's rapidly growing civic center. Studies indicated that an underground station would cost considerably less than a surface structure—particularly a surface structure that would harmonize architecturally with the large civic center buildings of the present and future.

Three 20,000-kva Pennsylvania Load Tap Changing Transformers are now "on the line" in this new underground distributing station. Despite space limitations, the transformers fit easily into their individual chambers—thanks to the compactness of Pennsylvania's new rectangular tank design. To solve the problem of cooling, transformer oil is pumped through flexible connectors to special oil-to-air heat exchangers (two for each transformer) that are sealed in the walls of outgoing air ducts. Air is drawn through inlet tunnels on the opposite side of the room, after which it passes around the transformer, through the heat exchangers, and into the outgoing ducts.

With more than thirty years of experience in the design and manufacture of power transformers, Pennsylvania can satisfy the usual as well as the unusual in installation requirements. For a discussion of your needs, contact Pennsylvania Transformer Division, Box 330, McGraw-Edison Company, Canonsburg, Pa.

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PENNSYLVANIA POWER TRANSFORMERS

the right combination for industrial power needs!

Only General Cable manufactures both...

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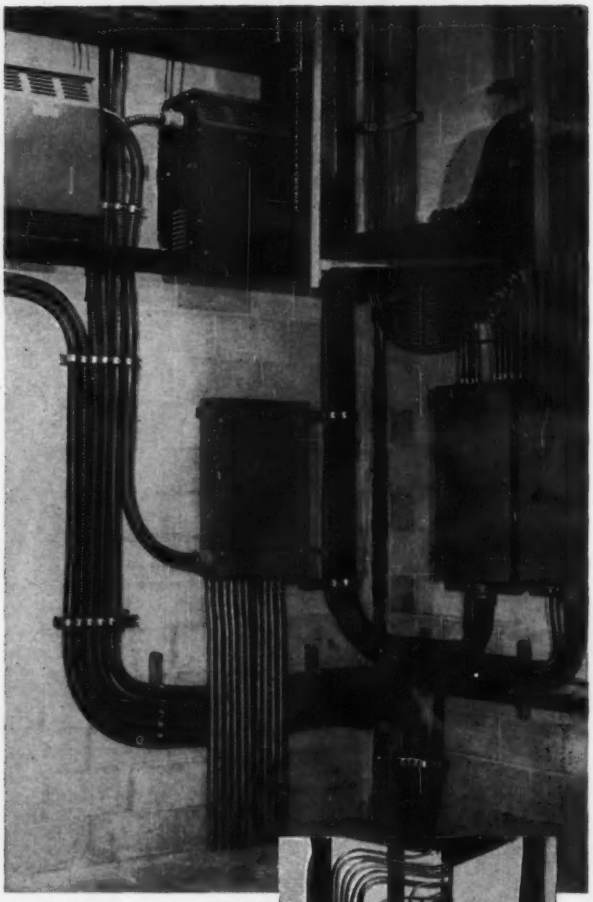
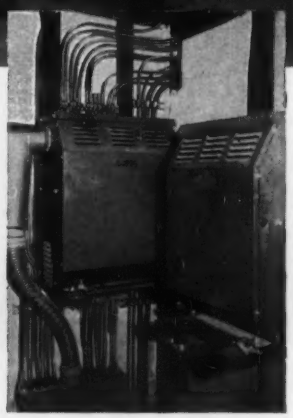
for distribution, control and lighting circuits



Installation at the St. Regis Paper Company, Jacksonville, Fla. plant.



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for primary power feeder circuits

Easy to install in all locations, both Safety M I Cable and Interlocking Armored Cable require no mechanical protection, thus lowering costs of installation and minimizing space requirements. These constructions are easy to train around equipment or structural members, assuring the absolute minimum of interference, and present a neat, functional appearance. In addition, Safety M I Cable has unequalled physical and electrical properties: it is completely resistant to moisture, aging, nearly all chemicals, and operates at continuous high temperatures. For truly modern wiring in your plant, specify Safety M I Cable and Interlocking Armored Cable. And remember; only General Cable makes them both.

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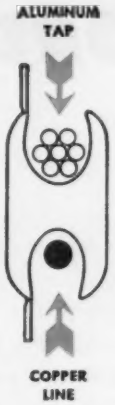
new! KEARNEY DOUBLE-TAB SQUEEZON



Exclusive Kearney design permits either groove to be used for line or tap. Diagram illustrates Double Tab Squeezon used to make an aluminum "step-up" tap to copper line connection.

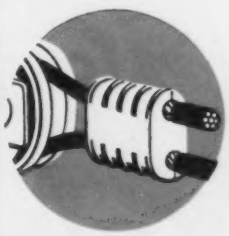
NOW! The Easiest Way to Make Both "Step-Up" and "Step-Down" Tap Connections on All Combinations of Copper, Aluminum and ACSR

The newest, most versatile Squeezon Compression Connector. Dual, fully open groove design, exclusive with Kearney, eliminates need to thread tap conductor through fitting. Use *either* groove for line or tap . . . make "step-up" or "step-down" tap connections quickly and easily. Double Tab Squeezons speed up deadending, too. Form the loop . . . drop the conductors into the open grooves . . . and compress! On insulated wire, remove only a "Squeezon-length" of insulation!

Available in a range of size combinations for aluminum, copper or ACSR. (Write for Selector Card.) Individually packaged in handy "Snap-Open" boxes; grooves factory-filled with Kearnalex inhibitor and contact aid.

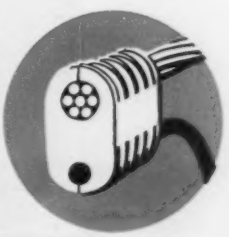
REVERSIBLE
The only compression connector with built-in spacer that makes *BOTH* "step-up" and "step-down" tap connections, from copper to ACSR, aluminum to ACSR, or aluminum to copper.

MASSIVE SPACER
Separates conductors . . . eliminates strand cutting . . . and aids in the prevention of galvanic corrosion between dissimilar conductors.



SECONDARY DEADENDING
Faster, easier. No threading through . . . form the loop, position Squeezon and compress! On insulated wire, strip only enough insulation to make the connection.

"SNAP-OPEN" BOX
Individually packaged. Box snaps apart along perforated line . . . INSTANTLY, CLEANLY . . . even with gloves! No stripping, no peeling.



NO DISTORTION
Squeezon groove jaws completely encircle conductor when compressed . . . provide dependable long-line, full circumference contact without distortion or damage to conductor.

for better construction . . . safer maintenance . . . specify KEARNEY products

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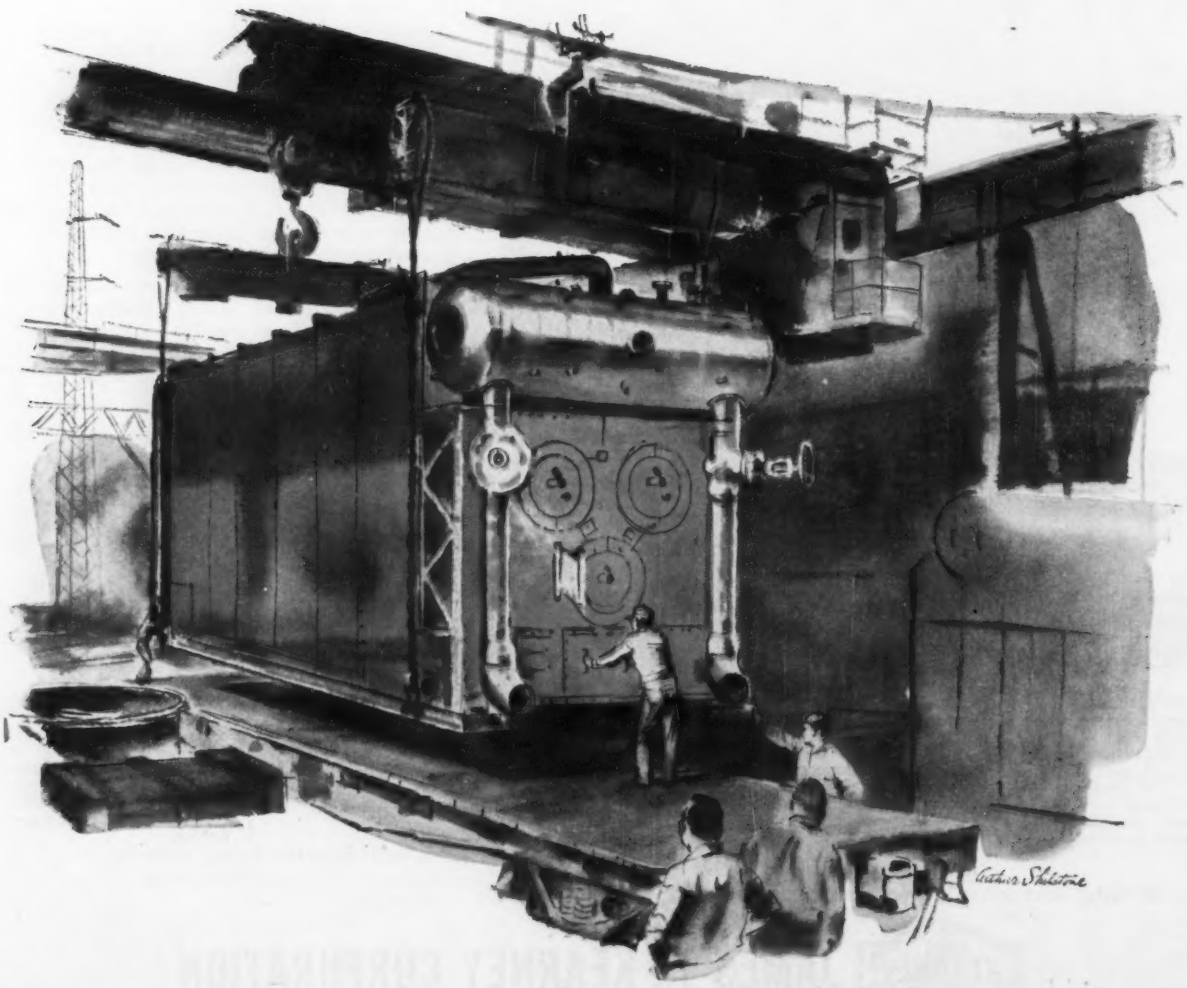
RECORD-BREAKING HIGH

. . . wrapped in a Package

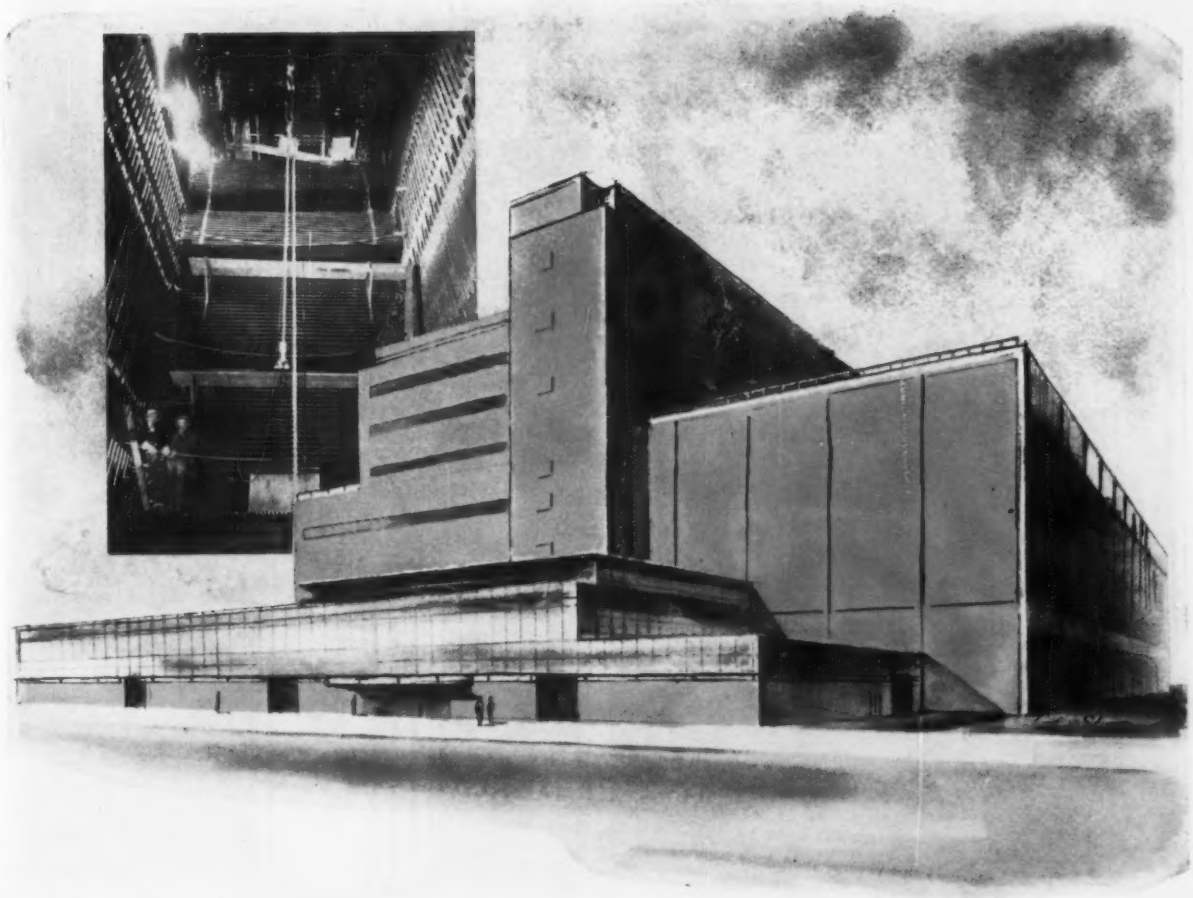
The plant on the facing page is the Eddystone Station of the Philadelphia Electric Company. It contains a C-E Sulzer Monotube Steam Generator, a small portion of which is shown in the upper left corner of the drawing. Later this year, when this boiler is placed in service, it will produce steam at the highest pressure and temperature ever used in commercial power practice — 5000 lb per sq in and 1200 F.

Shown below is the world's highest-pressure "package" boiler — a C-E Controlled Circulation Unit — Type PCC. It is designed to produce steam at a pressure of 1800 psi and 1050 F. Now installed at the General Electric Company plant at Fitchburg, Massachusetts, it provides steam for special testing purposes.



PRESSURE BOILERS by C-E

. . . or filling a Plant



The facts on the opposite page are of significance to you. They are part of the long list of C-E "firsts"—a list which includes the world's first boiler designed to produce as much as 3,850,000 lb steam per hour—and the world's largest package boiler, which produces 120,000 lb steam per hour. They give further evidence that—even in the biggest sizes and in the highest pressure ranges—C-E offers the most advanced designs for all steam requirements and with all fuels. To date, 38 C-E units have been purchased to provide 2400-pound pressure steam—or above—at the throttles of turbine-generators that have an aggregate capacity of about 8-million kilowatts. Fourteen of these units are already in service—one for a period of over three years.

When you are in the market for high-pressure boilers, it will pay you to contact the organization which offers you the broadest experience in the field—Combustion Engineering. In addition to these high pressure units, C-E also offers boilers in all types and sizes with capacities ranging from 4000 pounds of steam per hour, up to the largest in the world. All are designed to meet your needs reliably, efficiently and economically.

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PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

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Smaller, lighter three-phase transformers

CUT CHANGEOUT COSTS

Greater Capacity on Existing Poles

You save money when load demands require capacity boosting by using Allis-Chalmers three-phase transformers. In most cases, your present poles are more than adequate when you change out with this new smaller, lighter three-phase transformer. In the Allis-Chalmers redesign program spanning all sizes, weight reductions average 25% — height 13 inches. Typical is the new 150-kva unit that actually weighs *300 pounds less* than an old 112½-kva transformer. Reduced weight and size result in improved handling convenience and save hours of installation time.

Operating economies, too

Curvacore design shrinks transformer size and cuts system operating costs. The effective use of preferred oriented steel results in a compact core with low losses . . . low exciting current. Get the complete story. See your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

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Curvacore is an Allis-Chalmers trademark.

Editorial Comment

JUNE 8, 1959

Are Conventions Effective Enough?

Research is now the common tool used in evaluating the value of intangibles as well as tangibles. Its methods can be adapted to almost any problem.

We think it would be appropriate to bring this device into use for evaluating the effectiveness of conventions. Too much manpower and expense is being invested in this American hobby for it to go on unquestioned.

We can think of many things to find out about conventions. An estimate of the cost, the publicity and public relations results, amount of useful information presented by speakers and retained by the audience, side values such as committee meetings held, are all matters of importance. Just a survey of the duties and responsibilities of those in attendance would be very useful for next year's program committee.

This is an idea we hope someone will exploit.

Joint Committee Would Ease Relocation Problems

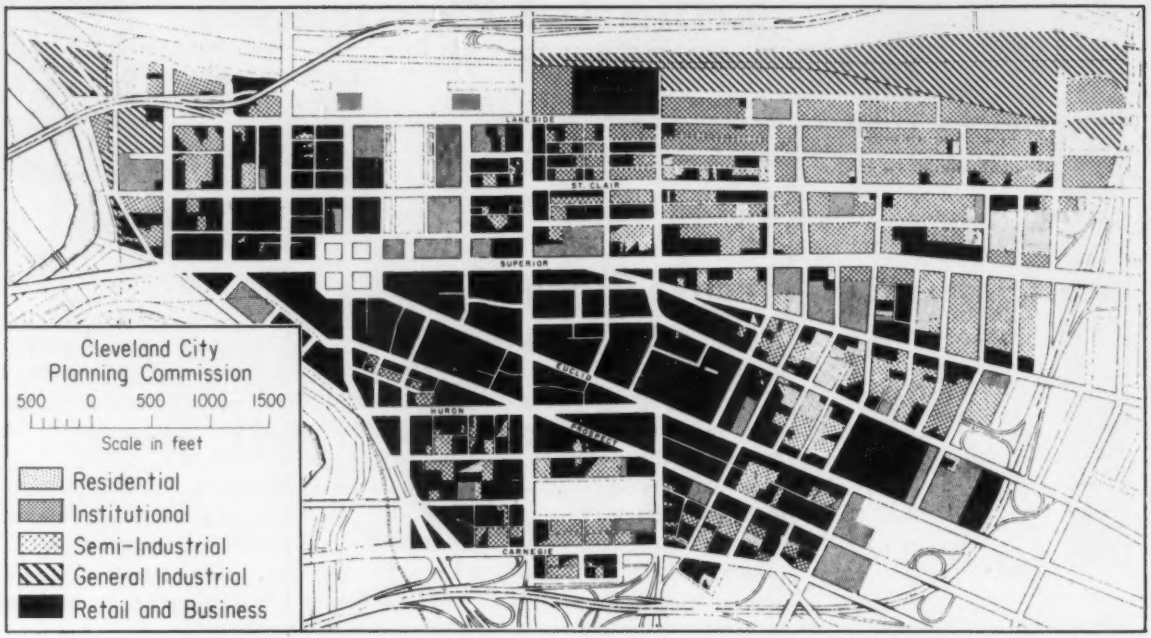
Serious industry consideration should be given to the proposal, originating with the American Right-of-Way Association, that a joint national "Committee on Highways and Utilities" be set up by utility associations. The purpose of this committee would be to establish a pattern of advance planning and coordination to guide the relocation of utility facilities. This committee would work with state and Federal agencies, represented by the American Association of State Highway Officials.

The American Right-of-Way Association through its recently created National Liaison Committee, headed by Detroit Edison's Richard H. Taylor, is working effectively to establish channels of communication which utilities and highway agencies can use to resolve conflicts over the relocation or removal of facilities under the Federal Highway Program. This committee, in short, is seeking to establish a climate of goodwill within which mutual advance planning can flourish.

Right of Way Association officials say that a joint national committee is also needed to bring order and consistency into relations among highway agencies and utility groups to the mutual benefit of all. Such a committee would consist of representatives of associations like the Edison Electric Institute, U. S. Independent Telephone Association, American Telephone and Telegraph Co, American Gas Association. American Petroleum Institute, American Water Works Association, American Public Works Association, Federal Sewer & Industrial Waste Association and others.

Today there is a vast and expanding network of utility services already occupying and seeking additional rights-of-way throughout the United States. Over the next 13 years conflicts are bound to arise as a result of the tremendous highway construction program provided by the Federal Highway Act. But conflicts can be kept to a minimum if planning, policies, and procedures to be followed by highway agencies and utility groups are coordinated on a national scale.

Formation of a national committee to establish these policies and procedures deserves serious industry consideration.



TODAY'S LAND USE REFLECTS DIFFUSION AND DORMANCY OF CONSTRUCTION IN CENTRAL AREA

How CEI Is Helping to Shape the D

Power company's active role in the city's 'master plan' ranges from participation of top executives to development of Cleveland as a management headquarters

Until last year, the skyline of downtown Cleveland had remained unchanged for more than a quarter of a century. No new building had gone up since the completion of the Van Sweringen brothers' famed terminal group on Public Square in the early 1930's.

Last year, however, saw the completion of one skyscraper and the start of another. It is no accident that the principal tenant of the first of these new buildings is Cleveland Electric Illuminating Co. Consistent with a philosophy that what is good for the Cleveland area is good for the Illuminating Company, CEI gave practical backing to the re-awakened interest in the downtown section by moving its headquarters into the structure on a long-term lease.

It was no accident either that when a group of professional planners was organized 20 months ago to formulate a long-range program for revitalizing the downtown area CEI took an active interest.

This interest started with the original financing of the project. The so-called "master plan for downtown Cleveland" was developed at a cost of $100,000, but it didn't cost Cleveland taxpayers a dime. The tab was picked up by four private foundations and funds. The biggest piece—$50,000—went to the Cleveland Development Foundation, a non-profit organization of industrialists of which Elmer L. Lindseth is vice president and in which CEI has been a powerful force and contributor of $150,500 since it began.

When the plan was unveiled May 21 at perhaps the largest civic luncheon ever held in Cleveland—1,500 persons attended—the master of ceremonies was Lee C. Howley, CEI vice president and general counsel. Howley was acting at that time in his capacity as president of the local Convention and Visitors Bureau, a strong booster of downtown improvement, but he is also a member of the City Planning Commission, under whose auspices the master plan was drawn.

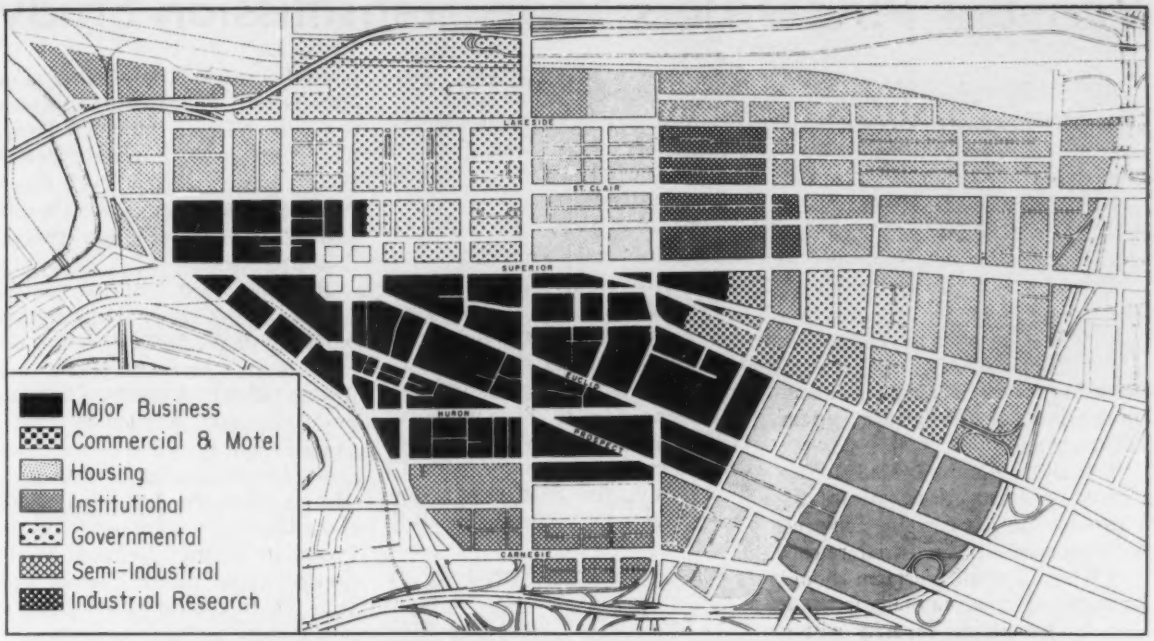
Although the commission played no part in formulating the plan, it will conduct public hearings on the proposals and have the final word in implementing them.

There has been no official price tag placed on achievement of the plan, but sources say overall cost in the next 15 years will be approximately $½ billion.

In drawing up a blueprint for a "new" downtown Cleveland, the professional planners faced up to some basic realities:

- Of Greater Cleveland's post-World War II expansion, more than 60% has gone to the suburbs. The same ratio holds true of the expansion in job opportunities.
- In 1945, the central city had 75% of the residents of Cuyahoga County; it now has less than 60%.
- More than 90% of the city's 135 suburban communities have personal incomes higher than the median for the central area.

The master plan was conceived as a means of laying out an integrated blueprint of downtown space needs and determining where new facilities could be located to produce their maximum contribution to a renewed vitality in the central city —to attract some of the industry, commerce, people and income that had been fleeing it.



1975 PLAN AIMS FOR RENEWED VITALITY THROUGH CONCENTRATION OF ACTIVITIES IN 'CORE'

Downtown Cleveland of Tomorrow

This concept fits quite naturally into CEI's long-range plans.

CEI has for many years been a leader in area development, on the theory that its prosperity is largely dependent on the growth and prosperity of the entire service area. CEI's area development department now has a team of 13 men under the direction of Robert C. Heinton, vice president, marketing. The department's annual budget is more than $200,000.

At first, the company concentrated on attracting industrial customers; then as the area development scope enlarged, the department set its sights on commercial and residential expansion as well.

More recently, it has begun to move toward a new goal—the development of Cleveland as a management headquarters.

These also are among the goals of the master plan, which proposes:

• Construction of new public office buildings on marginal property near existing business areas and near the main arteries of public transportation. In addition to occupying some "decaying edges" of the present main commercial area, this would serve to consolidate the city's business activities and to create a climate in which management headquarters could flourish.

• Development of an industrial park for light manufacturing in the northeast section of the city extending to the shores of Lake Erie, where rail, truck and water transportation would be close at hand and from which access to the central "core" of the city would be easy.

• Construction of high-rise apartment buildings in two areas bordering on the "central core." These two areas would comprise 70 acres of downtown space. The planners said they felt downtown vitality would be stepped up by an increase in the number of downtown residents, thus reversing to a degree the

(*Continued on p* 118)

PLAN'S PREVIEW brought out 1,500 people who learned that since WW II 60% of Greater Cleveland's expansion has gone to suburbs; this holds for jobs, too

Vermont PSC Orders State Transmission Study

Commission's action stems from disapproval of Velco-St. Lawrence power contracts. Zinder & Associates to do study

Vermont Public Service Commission has employed H. Zinder & Associates, consultants, to make a special study of electric transmission facilities in the state, according to an announcement by Charles R. Ross, PSC chairman.

The study and report will cover, according to a Zinder statement, three aspects of transmission system adequacy and use:

- Analysis of current loads to determine whether greater use of St. Lawrence power can be achieved with promotional industrial rates.
- When, if at all, Vermont should be prepared to substantially increase its total generating capacity within the state to insure a dependable, continuous power supply.
- What amounts of either additional generated or purchased power can reasonably be expected to be requested.

Public Power Attack Spurs Action

Background for this PSC action stems from attacks by public power advocates against the contract between the State of Vermont and the Vermont Electric Power Corp (Velco) organized in 1956 and 86.5% owned by Central Vermont Public Service Corp; 9% by Green Mountain Power Corp and 4.5% by Citizens Utilities Co.

Under license from Federal Power Commission, the New York Power Authority has contracted with Vermont PSC to supply 100,000 kw of firm power from the St. Lawrence River Project until 1985, starting in late 1958. This 100,000 kw represented 66% of the 1957 power requirements of Vermont and one half of the present requirements.

Velco was organized to construct and operate 115-kv transmission facilities to receive and deliver St. Lawrence power to distributing utilities and to contract with the commission as agent for its transmission. Under contract of June 1957 the company undertook to finance, build, and operate the transmission system. The state will pay for this service.

Vermont PSC has made a firm allocation of 45,567 kw to Central Vermont Public Service Corp for period ending 1985. An additional allocation of 5,529 kw is subject to recall on 3-yr notice. This is roughly 50% of the company's present maximum power requirement. Delivered cost of St. Lawrence power, including estimated transmission charges, is running 7½ to 8½ mills per kwhr, depending on load factor when taken, as compared with 12 to 13 mills for bulk power purchased from New England Power Co.

Rural electric cooperatives in Vermont sought unsuccessfully in 1957 to have the transmission built by the state. Meanwhile the transmission contracts came under sharp attack during the last state election.

Present Vermont Public Service Commission Chairman Charles R. Ross was appointed on March 1, 1959 to replace O. L. Shepard, whose six-year term expired early this year.

FPC 'Review' Sought by Ross

Since his appointment, Ross has indicated his continuing disapproval of the St. Lawrence transmission contracts by directing a copy to the FPC "for review," and by the more recent designation of Zinder & Associates to study the contract.

This latest action by the PSC poses several questions:

1. If additional transmission and generating capacity is found necessary, from whom would it be requested?

2. What reason does the commission have to think that utilities, making up Velco haven't taken care of the state's needs?

3. What objections does the commission see to the present St. Lawrence transmission contract?

4. Why should the state request more transmission and generating capacity?

In answering these questions for Electrical World, Ross said private utilities in the state had indicated need for new generation in the next five to ten years. The commission, through the Zinder report, he said, is seeking to establish whether more efficient use of existing transmission ties with Niagara Mohawk Power Corp and New England Electric Power, as well as New York Power Authority, might not serve as a substitute for additional new generation in the state.

Ross observed that the request for the Zinder study stems from a bitter legislative battle over the last eight years between public and private power. Victory by private power, he said, has led to careful examination of the St. Lawrence transmission contract by opponents who apparently feel that 85% ownership of Vermont Electric Power by Central Vermont Public Service would permit Central Vermont PS to control power industry in the state.

Reduced Competition Feared

While Ross conceded that dealings to date had been above reproach, he suggested that such concentration of control could be misdirected so as to reduce competition between existing private companies such as Green Mountain Power and Citizens Utilities. It is for this reason the commission, under direction of the legislature, has concerned itself with the Velco transmission contracts, and not, he added, with the power contracts with New York Power Authority.

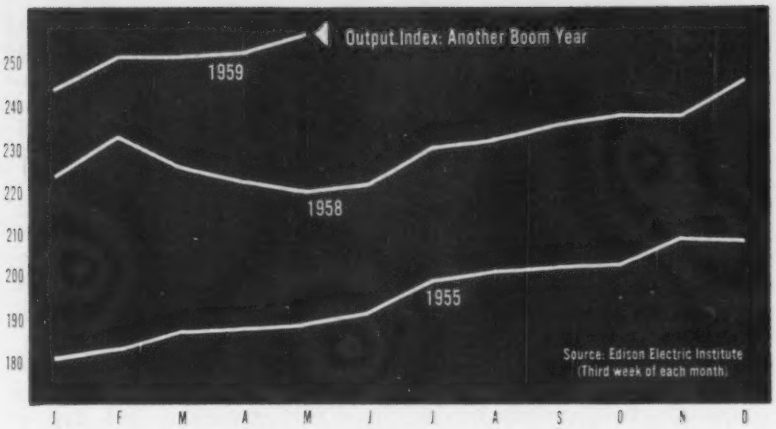
H. Zinder & Associates, Inc, provides services to gas and oil production, transmission, and distribution companies; electric companies; government agencies; and financial institutions. Prior to undertaking the Vermont study, Sol Schultz, former BPA chief engineer and now a Zinder partner and manager of the firm's Seattle office, completed an overall power resources study for the Oregon Public Service Commissioner out of which came the revival of the proposed transmission tie between California, Oregon and Washington.

COMING

Annual report on Atomic Power Progress—in the issue of June 22.

Second quarterly report on Electric Utility Methods in the issue of June 29.

Weather plays its unpredictable role, but solid industrial growth and modernization account for . . .



The Bright Outlook on Output

The indices of the electric utility industry are lending encouragement to those who are comparing 1959 prospects with the boom of four years ago.

Actual output (see p 19), the output index, above, and now a general sampling of the outlook by utility officials on year-end output totals tend to confirm the bullishness. The main exception, of course, could be the impact of a prolonged steel strike.

Dean H. Mitchell, president of Northern Indiana Public Service Co, in a response typical of answers from 14 systems contacted by Electrical World, has this to say: "We anticipate steady improvement during the year and a continuation of greater than normal improvement in industrial growth." For the first four months of '59, kwhr sales have exceeded earlier estimates by about 13%. More significant, though, is the breakdown: Residential sales are up 1%; rural, up 2%; industrial, up 23% and miscellaneous, up about 13%. These gains reflect the recovery of the area's steel mills and related industry, and a cold winter.

Industrial Picture Better: Isley

Carolina Power & Light Co's Hugh G. Isley, general sales manager, gave this recap: "The industrial picture is better than it has normally been. We attribute the increased output (over 1958) to expanded industry and a step-up in business by existing industry in the company system. Also, there have been gains in commercial, farm, and residential business." Unseasonably cool weather kept air conditioners idle during May so output figures were slightly under budget last month.

California's dependence on irrigation pumping is particularly noticeable this year. The 1958-59 winter was one of the driest on record; 1957-58 was one of the wettest. Pacific Gas & Electric Co's agricultural sales for April hit 322,227,000 kwhr, or four times April, 1958 sales. Industrial sales for the same month were up 16%; domestic and commercial were down slightly.

Housing Spurt Helps PG&E

Aside from weather, which, as PG&E puts it, accounts for large but temporary bumps in the long-range pattern of power consumption, a major factor in increasing load is steady population growth. Housing construction was brisk last fall and new power connections are now reflecting that spurt. Another splurge in housing at this time will bear similar fruit for PG&E this fall.

Water pumping in the Los Angeles area is accounting for a 2.8% increase over Southern California Edison Co's first quarter output budget. In addition, growth has come as expected through increased population and industrial activity.

Sales for Public Service Co of Colorado are a fraction under its early '59 estimate because of a prolonged strike at Climax Molybdenum Co, the utility's biggest customer. The 1957 to 1958 increase in sales was at a rate of about 7 to 8%, notes L. R. Patterson, electric operations assistant vice president.

For the Tennessee Valley Authority, "Sales of TVA power are increasing about as expected," despite some slow-down on industrial loads during the recession, a spokesman said. "Except for the aluminum loads, industrial sales have recovered to the extent that they are now back to approximately the long-term trend." The aluminum loads are showing a stronger tendency toward recovery, he said, and should be back to normal soon, if this trend continues. Meanwhile, expansion of existing industry and residential usage helped take up the slack.

The comeback of the auto industry and a 15% gain in appliance sales over 1958 are reflected in Detroit Edison Co's figures. For the week ending May 23, total usage was 282,748,000 kwhr, an increase of 25.1% over the same week in 1958. Detroit Ed anticipated the spiraling demands made so far this year, particularly the industrial share of it, a spokesman said.

Estimates Close in Texas

Dallas Power & Light Co and Texas Power & Light Co—both serving areas only moderately hit by the business downturn—report output is practically on the button. "Estimated energy sales for all of 1959 shows a 10.7% increase over 1958 sales," observes D. C. Merrill, chief of DP&L's rate and economic research department. Sales for 1959 are up 9.4%.

Leonard R. Byron, vp and man-

ager of TP&L's operations, says: "So far this year we have exceeded our budget only slightly—2.8%".

A generated-power growth rate of roughly 12% a year for Georgia Power Co is "due largely to constant gains in new industry and expansion of existing industry," says Joseph Browder, assistant to the sales vp. "In addition . . . we are adding 25-30,000 new accounts each year, the bulk of which is residential." May load was 3.5% above budget.

Commonwealth Edison Co's first quarter sales were up 12% over the same period for 1958. Industrial sales have risen 16.2%. The figures are "a little higher than earlier forecasts," a spokesman said.

Recovery of energy sales has been going forward steadily for New England Electric System. The outlook appears favorable for the year as a whole owing to factors such as specialized industrial development. As a case in point, Attleboro, Mass., once a jewelry making center, gained 22% in electrical energy use in the third week of May due to increased metal working activities. Another factor is the growing interest in electric heating.

Potomac Electric Power Co, serving the Washington, D. C. area, which has few industrial plants, says '59 output to date is about normal. "We are expecting a normal yearly increase for 1959, namely about 7.4%," a spokesman observes.

In Acton, Mass., Air Reduction Co's new plant has put a 3,500-hp motor drive working 364 days a year on an around-the-clock basis. Boston Edison Co says this is one example of new and expanded industrial development. For the week ending May 23, the power company's output was up 14.1% over the corresponding 1958 week. The company says some concern exists on the effects of foreign imports of machinery and autos, but that the outlook is good for power sales.

$7.5-Million 'Project EHV' Started

A brief ground-blasting ceremony marked start of construction on a five-year, $7.5-million study project on extra high voltage transmission. J. W. Seaman, general manager of General Electric Co's power transformer department, sets off the dynamite charge for footing excavation at the site of the company's 4½-mi, 750-kv prototype line near Pittsfield, Mass. Pier Abetti, manager of "Project EHV," looks on.

Attending the ceremony were members of a newly-formed committee of consulting engineers, meeting for the first time to review technical plans for the project. J. Harold Foote, chief engineer, Commonwealth Associates and president-elect of AIEE, described the undertaking as one of vital interest to the engineering profession. L. R. Gaty, a Philadelphia Electric Co vice president, and chairman of EEI's extra high voltage task force, called it a major step forward.

Rate Hike Trimmed

N. Y. PSC chops Niagara Mohawk bid to $7.5 million

A $10.5 million a year rate increase requested by Niagara Mohawk Power Corp was reduced to $7.5 million by recent action of the New York Public Service Commission. This is an increase of 5.9%.

The commission departed from a current trend of giving year-end or forward rate bases, computing the net original cost rate base by monthly averages.

From this rate base, it also deducted the restricted surplus arising from normalization of taxes under Section 168 of the Internal Revenue Code (accelerated amortization), and allowed only actual taxes in computing cost of service.

PSC also used actual taxes under Section 167 of the code (liberalized depreciation). Niagara-Mohawk had already been using the "flow-through" method of accounting favored by the PSC in its March 30 policy statement.

The rate increase granted will result in a 6.25% return on the rate base allowed. However, if taxes were normalized under Section 168 only, the equivalent rate of return would amount to only 5.5% on the same rate base. Before the present increase, the company had claimed a return of only 4.3% on its rate base.

Gas Explosions Damage Commonwealth Ed Boiler

A Commonwealth Edison Co boiler was damaged by a series of gas explosions at the Crawford plant in Chicago May 30. Cause of the blasts has not been determined yet, the company said. No personal injuries or interruption of service resulted.

Damage "is estimated upwards of $250,000," the company said. Repairs will take about two months. The boiler, which produces steam for a one-year-old 215-Mw unit, was being warmed up after a two-day shutdown when the explosions began. Natural gas was in use at the time.

Field Defibrillation Seen Nearer

So says resuscitation expert at Washington EEI meeting at which transmission developments get major attention

Counter shock, not drugs, is the most effective way to stop heart fibrillation caused by electric shock, the Edison Electric Institute Transmission & Distribution Committee was told recently in Washington, D. C.

More than 400 applications of this technique were successful on human beings, said Dr W. B. Kouwenhoven, lecturer on surgery at Johns Hopkins University and authority on resuscitation. It was applied 18 times in Johns Hopkins Hospital without a failure, he said, noting that currents of 5 amp at 440 v were applied for ¼ sec.

But the special clinical equipment for applying counter shock, he said, is too cumbersome for field use. A field device, weighing only 40 lb, now under development, may be available within a year, he added.

Dr. Kouwenhoven's successful research in defibrillation by counter shock has been sponsored, in part, by the EEI. His report to the T & D Committee was a feature of the two-day technical program otherwise focused on transmission developments.

Long range plans of the Potomac Electric Power Co to build a northwest-to-southeast crescent of 230-kv steel tower lines around Washington, D. C., was described by D. C. Vaughan. The two lines, on separate rights-of-way, will have a maximum capacity of 1,500 Mva and will be designed for maximum reliability. The crescent, in effect a system bus, will take power from future generating stations at Dickerson and Chalk Point on the east side of the Potomac. Future system load growth will be supplied from it by 138 or 230-kv lines extending toward the city, probably underground. The crescent, consisting initially of single-circuit lines on double-circuit towers, will be completed in 1963, Vaughan said. Early planning, he said, was dictated by need to purchase rights-of-way in an area of increasing density.

Following carefully coordinated construction procedures Connecticut Light & Power Co crews recently erected a 4-circuit, 115-kv tower line on the centerline of an 80-ft right-of-way occupied by an old tower line carrying two 69, and two 28-kv circuits. The new four-circuit towers were erected in sections on new foundations that surrounded towers carrying energized circuits. The operation was carried out during the winter load period with only one lost time accident and virtually no curtailment of service.

Need for advance planning, land economic studies, and better liaison

(*Continued on page* 102)

House Heating Poses Challenge

High-use customers will shape design of future systems, PEA meeting told. Economics of peak-shaving units discussed

Electric house heating as a challenge and use of peaking capacity to replace older steam turbine-generator units occupied top positions on the program during the Spring meeting of the System Planning Committee of Pennsylvania Electric Association, Greensburg, Pa. Estimated annual average usage of 10,000 kwhr per residential customer by 1975 should be taken as a challenge to electric utilities, rather than a forecast. This was the view of R. G. MacDonald, marketing vice president, West Penn Power Co, who said system planners can contribute much toward making this estimate a reality. They can keep in mind the design of systems of tomorrow that will take care of residential customers with 10,000 kwhr average annual use.

MacDonald stressed the important role that electric house heating will play in the future. While consumption of heavy-use appliances will go from 3,600 kwhr annually to about 7,800 kwhr by 1975, the biggest single boost will come from electric house heating, which will consume about 2,200 kwhr annually per customer. He detailed a continuing study of 14 all-electric customers on the West Penn system. Average weekday demand during the coldest week in February, 1958, was about 16 kw, including water heating. The electric heating load superimposed itself favorably on the system load curve and peaked in the morning. These customers averaged about 4,400 kwhr for general use and 15,451 kwhr for heating for a total of 19,874 kwhr annually.

Opinions of these customers regarding quality of electric service may be valuable to system planners, said MacDonald. They feel reliable service should be consistent with sound economic planning, and ask that the utility work toward a reduction in outages, particularly from November to March.

Consideration of the annual load duration curve can bring significant savings in investment and future annual costs when new generation is being sought to replace older steam turbine-generators. Replacement capacity, said R. C. R. Schulze, Atlantic City Electric Co, can either be part or all of the next large conventional unit or can be equipment suited for peaking purposes, such as medium-pressure steam equipment, gas turbines or diesel generators.

In setting the stage for consideration of peaking capacity, Schulze pointed out a typical load-duration curve will show that 50% of total kwhr generated is produced by the first 30% of total capacity, but only

(*Continued on page* 119)

Automatic Pneumatic Handling

Sewaren Station handles by-product on efficient basis for sale for use as concrete filler

Fly ash from burning pulverized coal is collected at Sewaren Station of Public Service Electric & Gas Co and sold as an additive to concrete. In 1957, the station sold 4,100 tons. This sale was facilitated by the station's automatic handling of fly ash.

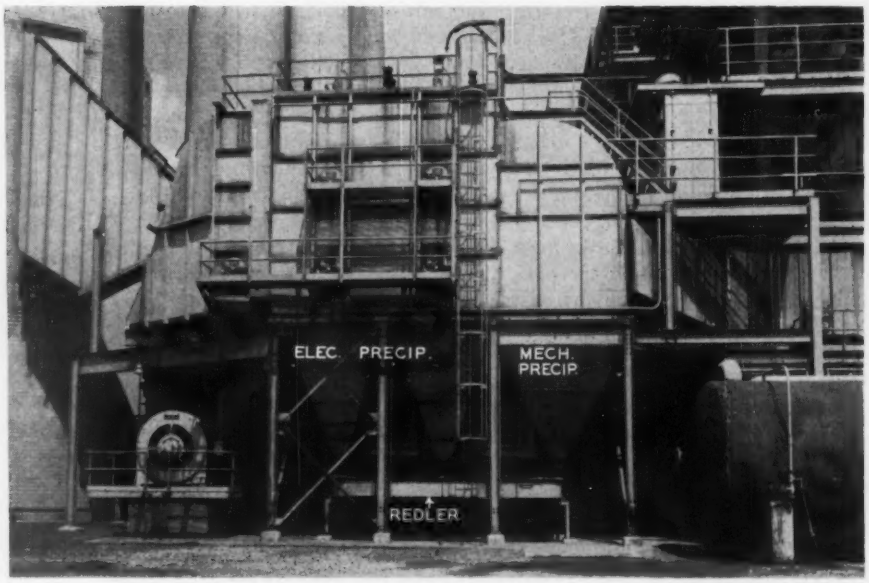
This station has four turbine-generator units which produce 470 Mw of electrical power. These are supplied by individual boilers producing steam at 1,050F and 1,500 psi. This takes about 950 tons of coal (or 160,000 gal of oil) per boiler per day at full load. Before it is blown into the furnaces for instantaneous combustion, the coal is crushed and pulverized to the fineness of talcum powder.

Combustion gases from the four boilers pass through four large combination electrical-mechanical precipitators, where fly ash particles are removed. Ten collecting hoppers under each precipitator on units 1, 2, and 3, and 15 under the precipitator of unit 4 retain the trapped out residue.

After the hoppers have collected fly ash over an 8-hr period, the handling system is automatically impulsed to begin operation. At the base of each hopper a motorized rotary feeder brings the contents of the hoppers into a bulk flow conveyor. A small amount of fly ash is collected in the economizer hoppers and fed by a screw conveyor to the bulk flow conveyor.

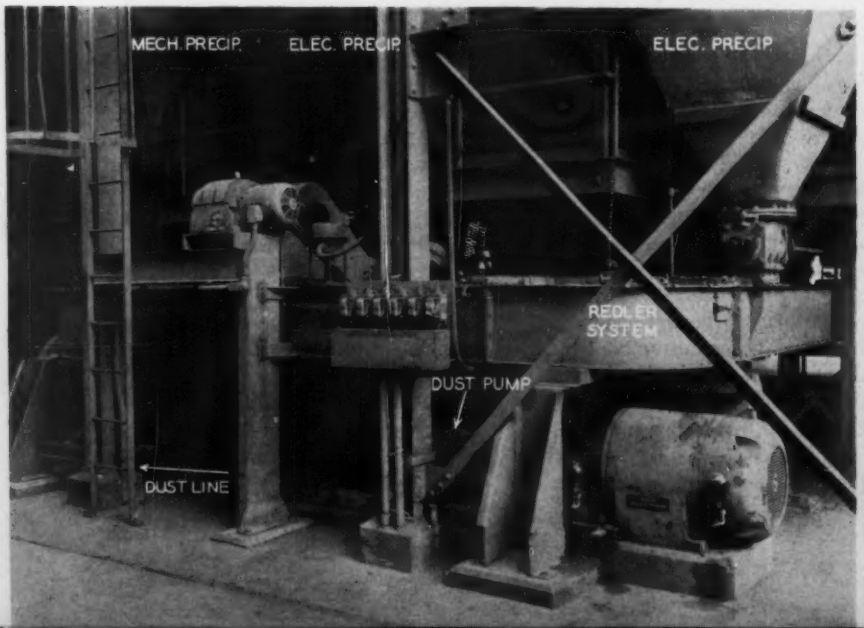
The latter conveyor carries the fly ash to the receiving hopper of a fluidizing pump for transfer through a conveying pipeline to either an ash rejection tank or the storage silo. Non-saleable ash goes to the rejection tank.

The conveying operation takes about 2 hr, after hoppers on the



PRECIPITATORS at Sewaren Steam Station discharge into Redler conveyor which carries fly ash to a Fuller-Kinyon fluidizing pump's receiving hopper

FLUIDIZING PUMP is installed below the conveyor discharge which transfers fly ash either to an ash reject tank under the boiler or to the storage silo



SALEABLE FLY ASH is separated from

Speeds Fly Ash to Market

next boiler unit begin unloading. This staged system of operation has two advantages: Only one main conveying pipeline handles all four pumps; and, one rotary compressor supplies all the air for pump operation. Fly ash volume made pneumatic handling a practical necessity. Dusting had to be avoided, material had to be diverted quickly from one place to another, high tonnages are involved, and fly ash originates at a distance from its storage.

The screw-type pump and conveying pipeline work on the principle that air tends to fluidize fine, dry solids, minimizing friction and making particles pumpable. Fly ash drops by gravity into a receiving hopper of the pump and is advanced through the pump barrel by the impeller screw. As it advances, it is compacted to prevent blowback. This is done by the decreasing pitch of the impeller screw and a variable space between the last screw flight and a check valve.

Passing the check valve, the fly ash enters the pump's mixing chamber, where compressed air from a series of jets fluidizes it. Entering the conveying pipeline, it is moved as a dense column at a low velocity.

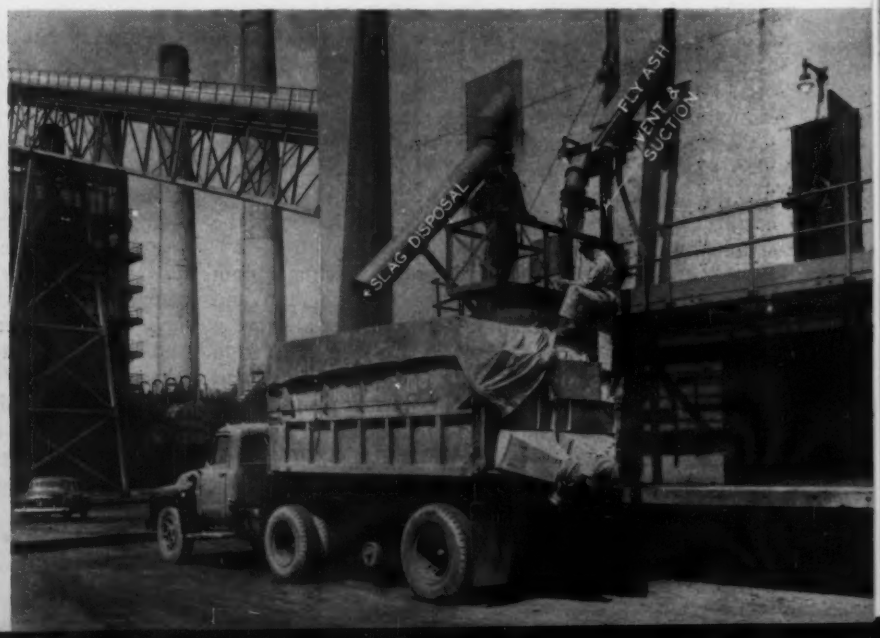
Handling has been made especially flexible through a two-way valve which permits unsuitable ash to be pumped directly to an ash reject tank. Diversion is manually controlled. High and low level indicators in the pump's receiving hopper control the conveyors under the precipitator hoppers.

Fly ash for sale is stored in two silos which hold 380 tons. A 360-ton silo is for bulk ash; the 20-ton silo for bagging. Fly ash can be purchased in bags or bulk. A spout at the base of the smaller silo is connected to the hopper of a small bagging machine for 50-lb bags. The silo's outer section holds ash for bulk shipment, and a spout transfers stored fly ash to tank or covered dump trucks.

TOP of dust silo shows point of entry of dust both from the pump and from reclamation. Spouts outdoors at the silo's base deliver fly ash to bulk trucks

unsaleable oil ash and other ashes

BULK FLY ASH is discharged from storage silo into a truck through Fuller loading-out silo spouting. The station sold 4,100 tons of fly ash in 1957



ROOF-MOUNTED microwave reflector in downtown El Paso is directed at the reflector on Cristo Rey Mountain, slightly over a mile away. Link connects El Paso and Las Cruces

Mountainside Reflector Directs

I. T. CORBELL, Microwave Design Engineering, Communications Products Dept, General Electric Co, Syracuse, N. Y.

J. F. STUART, El Paso Electric Co, El Paso, Tex.

A microwave communications and relaying system utilizing passive reflectors has proven reliable and economical for El Paso Electric Co. The reflectors, installed on mountains in the El Paso area, have eliminated the need for towers at the receiving stations.

System growth in the El Paso area required rapid expansion of facilities that could not be accommodated by existing installations. In meeting the expansion requirements, microwave, power line carrier, private wire lines and leased lines were considered. Because a large proportion of the channels are used for protective relaying, a high degree of reliability was required. The communication facility had to be expandable to 24 voice circuits with low initial investment.

A quick review of wire line facilities showed a large number of unpredictable outages with weather changes. Pilot relaying is impractical on some lines because of high loop resistance. Wire lines were also more costly than other methods.

Expansion of the existing power line carrier system was impractical because of frequency congestion in this part of the system. Release of power line carrier equipment to other parts of the system would greatly simplify communication in those areas.

Microwave communication was questioned as whether the present low number of voice circuits justified the initial expense. Studies indicated that economic requirements could be met if the 38 miles could be spanned without using towers.

Inspection of the area revealed that adequate path clearance existed between Cristo Rey Mountain and both ends of the longest distance to be bridged. Because available property on Cristo Rey is over a mile from Rio Grande station, high gain microwave equipment was required to provide a 40-db path margin. The signal attenuation in a path including a passive repeater is

$$\alpha = 171 + 20 \log \frac{d_1 d_2}{A \cos \theta/2}$$

Where:

α = Attenuation in db
d_1 = Distance in miles from one station to reflector
d_2 = Distance in miles from other station to reflector
θ = Angle between incident and reflected beams

With existing system parameters and a 400-sq ft reflector, this equation gives a path loss of 151 db.

Because of construction and rigidity problems, the reflector area is limited to 20 x 20 ft. The maximum allowable deflection is 1 in. with 20-lb wind loading. It must withstand 30-lb wind loading without permanent set to any structure member. Perforations of ⅝-in. diameter reduce wind loading. Perforation and rigidity limits were established for a 2,000-Mc frequency. Increased rigidity and smaller perforations are required at higher frequencies.

A net equipment and antenna gain of 191 db is required to provide a 40-db path margin. An equipment gain of 125 db with 14-ft antennas (73 db) and transmission line losses of 6 db provides a 41-db path margin.

The equipment has an 80-w transmitter power rating to provide the high gain necessary to meet path margin requirements. To divorce the reliability of the microwave from that of the power system, rotating machine inverters operating from the 120-v station battery were installed at each location.

The transfer-trip relaying channel uses frequency-shift tones submultiplexed on the voice channel. The normal operating frequency of the tone channel provides a guard against tripping. When tripping is required, the tone shifts to another frequency, de-energizing the guard circuit and actuating the trip relay. The two functions are interlocked so that tripping cannot occur until the guard is removed. If the guard tone disappears without tripping, an alarm circuit is energized, indicating a circuit failure. The tripping speed of the channel is about 13 milliseconds.

The directional-comparison relaying channel operates directly over one of the microwave channels. With time-division multiplex, audio is transmitted by varying the position of a channel pulse at the audio rate. A dc

Passive reflectors, mounted on nearby mountains, have proven to be less expensive than conventional towers

PASSIVE REPEATER installation on Franklin Mountain helps provide link between Rio Grande and Santa Fe. Section was built after Las Cruces-Rio Grande microwave link

Microwave to El Paso Building

function can be transmitted by detecting the absence or presence of this pulse. For directional-comparison relaying, the pulse is normally transmitted and activates a receive relay which monitors the circuit. When a relay blocking signal is required, the pulse is dropped. Major advantages of using the channel pulse are less equipment and high operating speed. The blocking signal can be transmitted in about 3 milliseconds, but is coordinated with the relay speed.

Measured path fading margin is 42 db, compared to a calculated value of 41 db. In 12 months of operation, no fading has been observed which caused a circuit interruption. Performance has equalled or bettered all specifications. Maintenance requirements have been small, and work is done by technicians already employed for maintenance of other equipment.

On the basis of successful completion and operation of the Las Cruces-Rio Grande hop, the remaining part of the system was installed using the same techniques and type of equipment. Tower requirements were again eliminated by using a reflector on Franklin Mountain.

Installation of microwave has released for other functions in outlying districts five power line carrier channels (two for relaying and three for voice). These channels were urgently needed and microwave was uneconomical in these sections.

Experience with the equipment indicates that:

1. Adequate system planning materially reduces cost of microwave. Continuous planning reduced costs to one-third of original estimates.

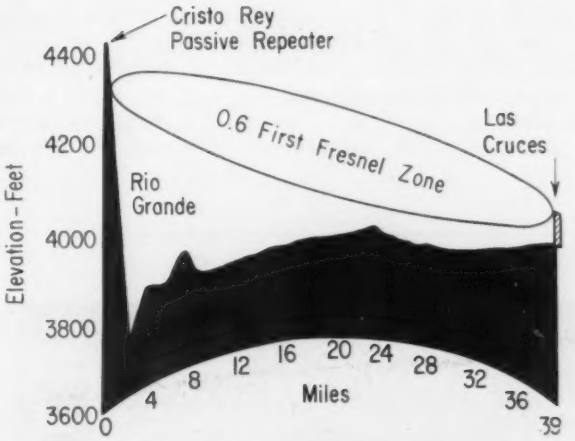
2. Many equipment options can be delayed until the size of the system justifies these expenditures.

3. Costs can be reduced by altering original plans so that stock items may be purchased.

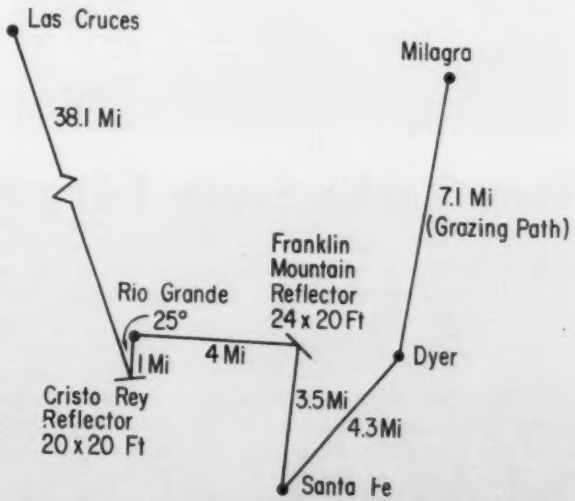
4. Experience gained from a small section of the system is invaluable in future planning on larger sections.

5. Inexpensive rotating machinery operating from existing station batteries provides a low cost, reliable source of ac power.

6. The use of passive repeaters is easier at lower frequencies, because surface smoothness and rigidity requirements are less severe than at higher frequencies.



RUGGED TERRAIN in the El Paso area required either expensive towers or some other means of repeating signals



COMPLETE SYSTEM was finished using techniques learned in construction of Las Cruces-Rio Grande 38-mi section

High-Strength Insulators Defy

B. A. CURRIE, Engineer of Transmission and Communications,

S. G. PANN, Transmission System Research Engineer, Los Angeles Department of Water and Power, Los Angeles, Cal.

Ground Rule No. 8 of Downey, Calif.'s Rio Hondo golf course reads: "Hitting power-line conductors on No. 5 permits replay without penalty. When tower is hit, play ball as it lies; if moved, penalty one stroke."

The rule refers to Tower 260-D-4, a 287.5-kv double-circuit dead-end tower located inside the golf course.

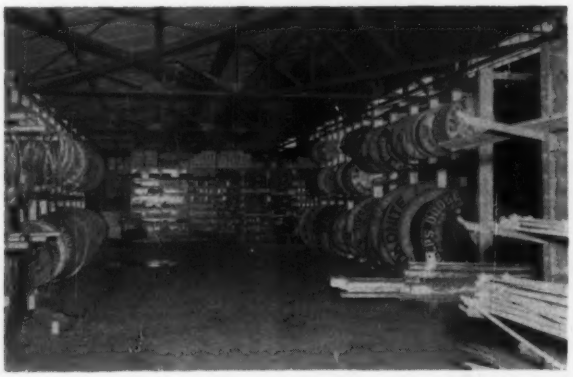
Prior to 1958, insulator replacements on this tower due to golf ball breakages averaged 60 units per year. Insulators were regular NEMA standard impact-strength units.

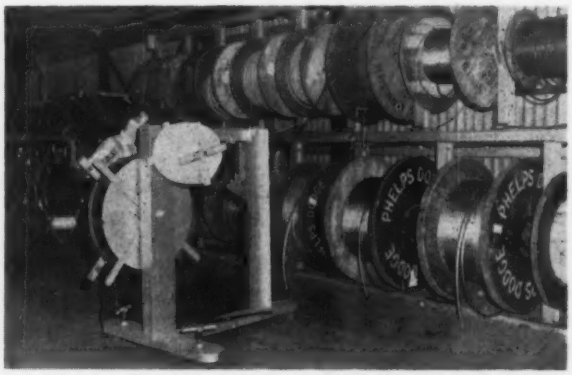
The 148-ft tower is about 165 yd from and 10 deg to the right of the tee on the 420-yd No. 5 hole. Heights of bottom, middle and top crossarms are 65, 91 and 117 ft. Tower insulation consists of twelve double strings of 26 5x10-in. units.

Line conductors and tower receive many golf ball hits annually because of proximity to No. 5 tee. When a ball hits a line conductor or a tower member, it concerns only the player. But, if it hits an insulator string, a common occurrence at Rio Hondo, it then becomes the Dept of Water and Power's concern.

Obvious disadvantages included line outages and material and labor costs of replacing damaged insulators.

Investigation of golf ball speeds related to suspension insulator impact strength resulted in development of laboratory apparatus capable of shooting balls at high speeds and measuring their velocities. Tests proved that standard impact strength units are not strong enough to resist impact of golf balls traveling at speeds over 80 fps. They





Two Racks Store Fifty Reels

JOHN C. HERBERT, Manager, Purchasing and General Services, Potomac Electric Power Co, Washington, D. C.

Reels of wire and cable in storage racks used by Potomac Electric Power Co are available for easy distribution of lengths of wire or cable as required. Up to 50 reels, ranging in diameter from 24 in. to 60 in., may be stored in two racks which save floor space and reduce labor.

Each rack consists of 8-in. steel I-channels positioned vertically and braced by smaller steel angles placed horizontally. Pipes to hold the reels are supported by notched plates welded to the channels. Reels are put in position and removed by forklift trucks. At one end of one rack, two rows of four pipes placed perpendicularly to the line of reels provide storage space for coils of wire.

The racks were fabricated in PEPCo service shops from accumulated pieces of scrap steel for about $400 each. A hand-propelled wire-measuring machine is placed in front of the rack where any size of cable may be fed to the meter and winding reel.

Duffers

also showed that high impact strength insulators would have a better chance of standing up.

LADW&P engineers investigated properties of high-strength porcelain insulators and their possible application on Tower 260-D-4. Tests on several high-strength suspension insulators showed these units had a minimum impact strength of 150 in.-lb, and also passed all other specified tests.

As a result, 624 high-strength insulators were installed on the tower in May, 1958. During the 12-month period that these units have been in service, no breakages have been experienced.

TEN-DEGREE slice can put ball into tower area on 420-yd hole. Annually, an average of 60 standard-strength insulators were hit and broken by golfers

Use Wrong-Size CT's for Emergencies

W. J. WRIGHT, Meter Engineer, Ohio Power Co, Canton, Ohio

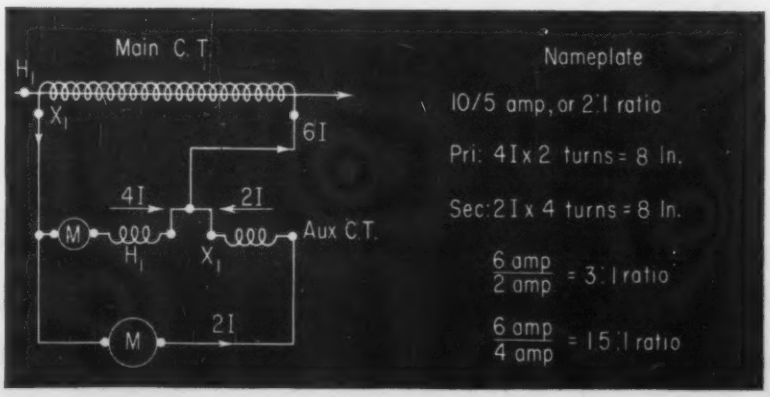
When a high-voltage current transformer of the correct ratio is not available for a metering installation, a combination of a high-voltage CT of an incorrect ratio and a low-voltage CT used as an autotransformer may solve the problem.

Seldom are identical spares available for high-voltage CT's which may be removed from service suddenly. Frequently a spare of the correct voltage class but improper turns ratio is available. By properly connecting the proper size of low-cost auxiliary CT, the high-voltage spare may be utilized without incurring the expense of obtaining the correct transformer.

If the mathematical ratios of the CT's involved are remembered, the proper overall metering ratio may be obtained. Suppose a metering installation has 400/5 amp (80:1 ratio) CT's and one must be removed temporarily. Perhaps the load on this installation does not exceed 300 amp and there is a 300/5 amp transformer available.

Because it is necessary to maintain a ratio of 400/5, the auxiliary low-voltage CT used should have a ratio of 80/60 or 1 1/3:1. This odd ratio could be obtained by using a 15/5 amp, low-voltage CT as an autotransformer.

This type of connection should always be replaced as soon as possible, however, unless suitable corrections can be made for the minor errors of the temporary installation.



New 161-Kv Line Is Adaptable

Wood-poles, H-frame carry Kansas City P&L's single set of conductors, but second set can be added when needed

FRANK W. SHAW, Engineer, Overhead Transmission Design, Kansas City Power & Light Co, Kansas City, Mo.

Kansas City Power & Light Co has installed 10.66 miles of 161 kv wood-pole, H-frame line with a single set of 556.5 MCM, 26/7 ACSR conductors, with provisions for bundling a second set of conductors with minimum line changes. The second set of conductors will be installed when it can be justified by the load served. The line will serve two new substations.

The only material installed for the second set of conductors was that which could not be added easily. It includes anchors, cribbing under poles to provide soil bearing surface for additional weight and sufficient pole and structure strength for two sets of conductors.

Code clearances for the ultimate of two bundled conductors was provided.

Spacing between poles of H-frame structures was increased from KCP&L's standard of 15.5 to 17.5 ft. This provided the required swing clearances and vertical clearances for the bundled conductor construction most economically. The 15.5-ft spacing would not give enough swing clearance for either vertical or horizontal bundling unless the poles were extremely high.

A section of line over rolling terrain was graded for both 15.5 and 17.5-ft pole spacing. To obtain the same swing limits the cost of higher poles for grading over the low spots with 15.5-ft spacing would have been considerably greater than that of the more expensive wider structures. Therefore, the 17.5 pole spacing was selected for the H-frame structures.

Sag Measurements Kept

The first set of conductors was installed without prestressing. An accurate record was kept on sag measurements during stringing and of measurements taken after sagging and clipping had been completed. At each end of the sag check spans, permanent marks were made on the poles at 1-ft distances below the conductor attachment level. Thus future sag measurements can be compared accurately.

KCP&L's past practice has been to use double strain yokes with 15,000 lb M&E strength insulators on deadends. This line was designed for single-string deadends with 25,000 lb M&E strength insulators of a color that can be distinguished from standard 15,000-lb insulators. The ball-and-socket insulators can be changed with hot-line tools.

The ball-and-socket, 10-in., disc insulators of 15,000 lb and 25,000 lb M&E ratings had in the past been of the same general color and size. When installed through error in the same insulator string, they could produce overstressing of the 15,000 lb units.

The cost of the single strings of 25,000 lb insulators, purchased at a 10% premium, was less than that of the double-strain yoke deadends with two strings of 15,000 lb insulators.

Conductors will be bundled verti-

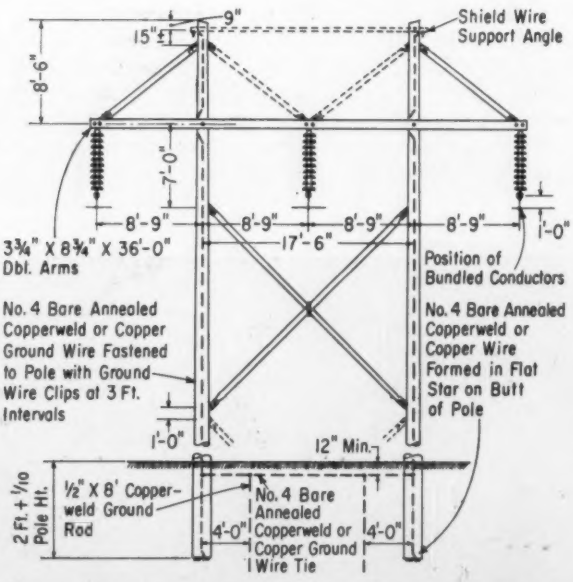

9"
15"±
Shield Wire Support Angle
8'-6"
7'-0"
8'-9"
8'-9"
8'-9"
8'-9"
1'-0"
17'-6"
3¾" X 8¾" X 36'-0" Dbl. Arms
Position of Bundled Conductors
No. 4 Bare Annealed Copperweld or Copper Ground Wire Fastened to Pole with Ground Wire Clips at 3 Ft. Intervals
No. 4 Bare Annealed Copperweld or Copper Wire Formed in Flat Star on Butt of Pole
1'-0"
12" Min.
2 Ft. + 1/10 Pole Ht.
½" X 8' Copper-weld Ground Rod
No. 4 Bare Annealed Copperweld or Copper Ground Wire Tie
4'-0"
4'-0"

FIG 1—**H-FRAME POLES** were spaced 17 ft 6 in. apart, instead of the Kansas City P&L's standard of 15 ft 6 in.

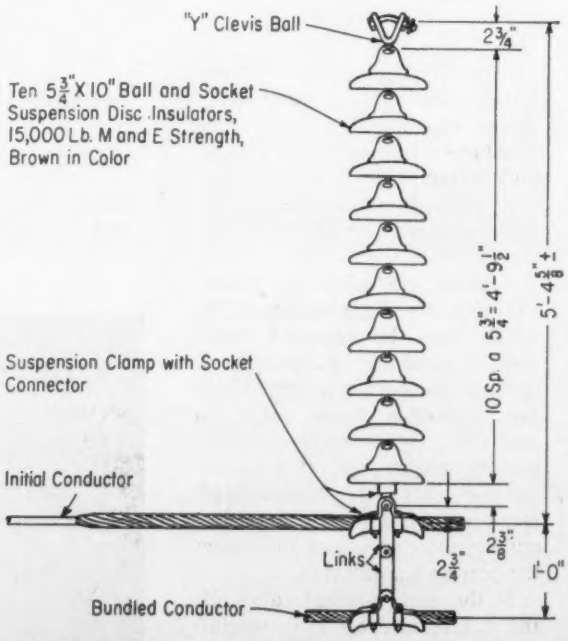


FIG 2—**CONDUCTORS** will be bundled vertically with 12-in. spacing at suspension strings, when load warrants change

to Bundling

cally. This arrangement permitted the first set to be installed without prestressing and to be deadended on pole bands in the normal manner, in the upper pole position. Turnbuckles were installed between the insulators and the pole for adjustment after the second conductor is installed and the two conductors bundled. They were locked in mid range.

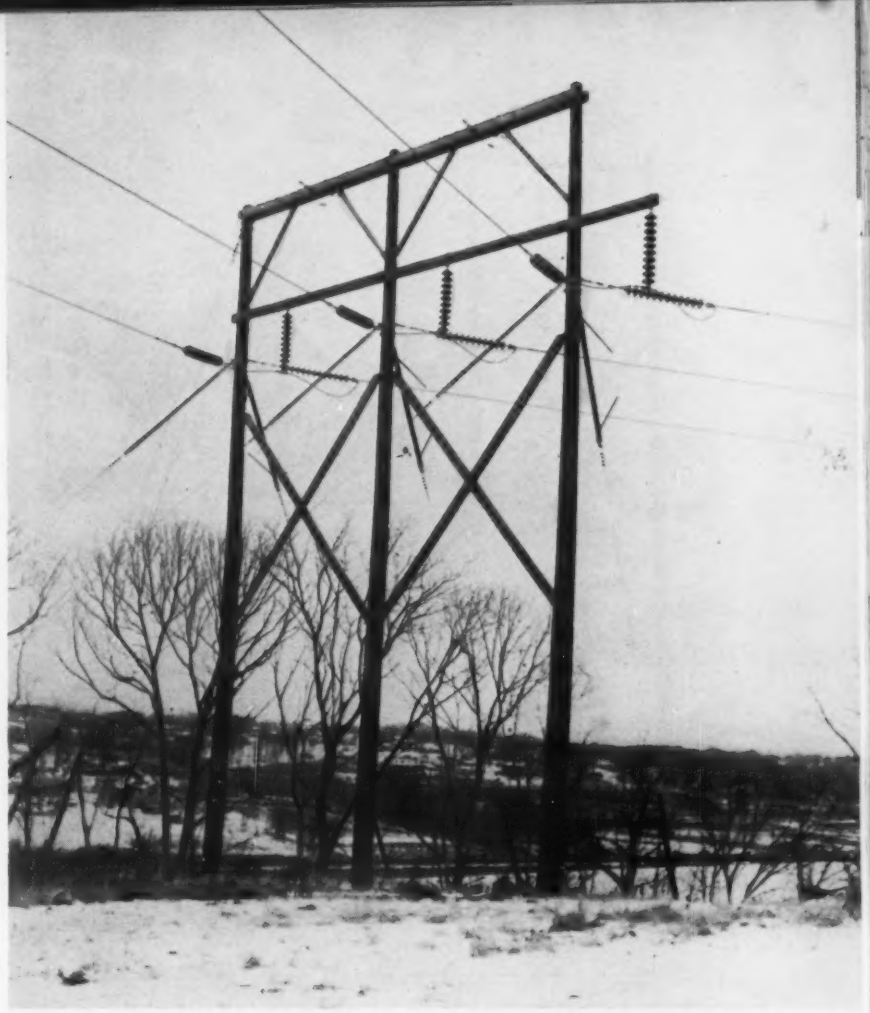
The heavy downthrust on the deadend poles from deadending two sets of conductors was held to values considered safe in column loading for Class 1 poles.

Three 3-ft sections of creosoted railroad ties under each deadend pole provide safe soil bearing pressures.

One anchor will be used for each two-conductor deadend with one ½-in. EHS galvanized steel guy per conductor. Both guys will be attached to a 1¼-in. by 12-ft triple-eye anchor rod with 20-in. crossplate anchor.

Only one guy was installed initially.

Where the soil was wet or the holding power of the anchor questionable, concrete anchors were



SPECIAL DESIGNS were developed for the heavy deadend structures. The design details for such a three-pole deadend structure are shown in Fig 4 below

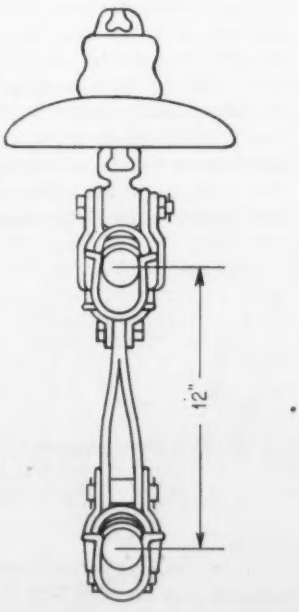


FIG 3—CLOSEUP shows how conductors will be held in connecting links

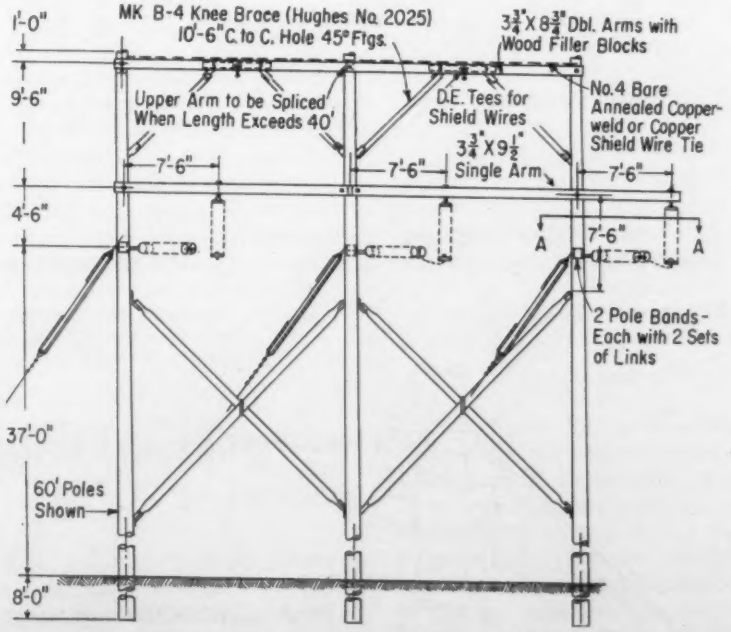
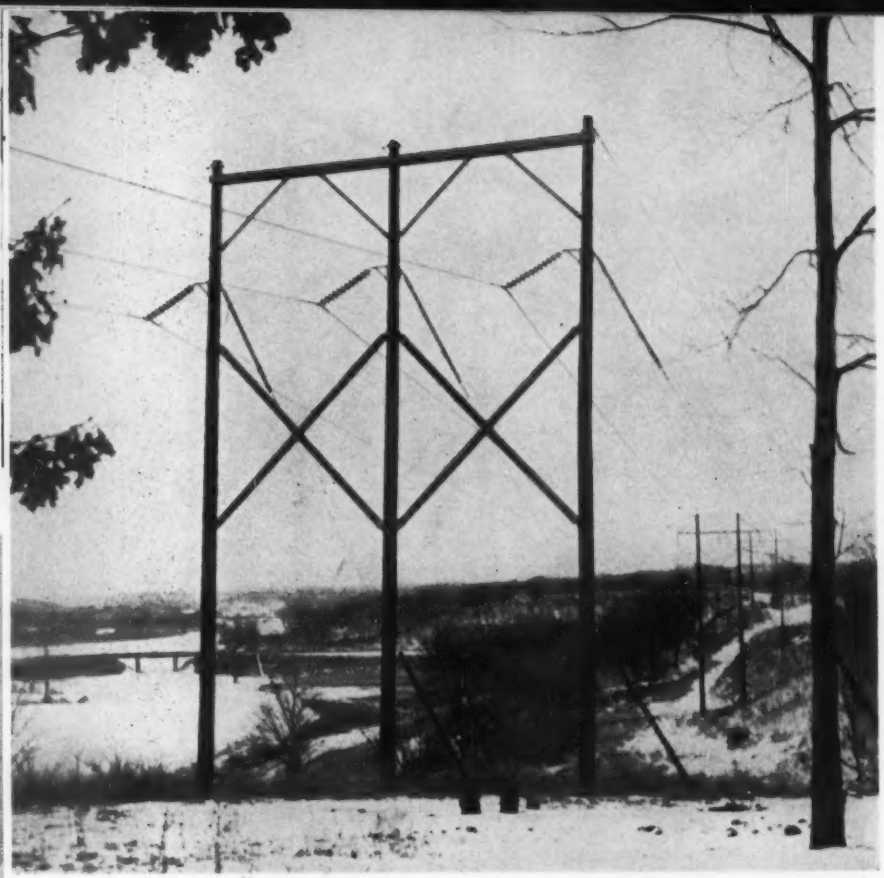


FIG 4—STRUCTURE designed for line angles between 25 and 80 deg. The drawing shows clearances on the 161-kv line as now established



MEDIUM-ANGLE STRUCTURES of this type were installed on the new 161-kv transmission line constructed to serve two newly built KCP&L substations

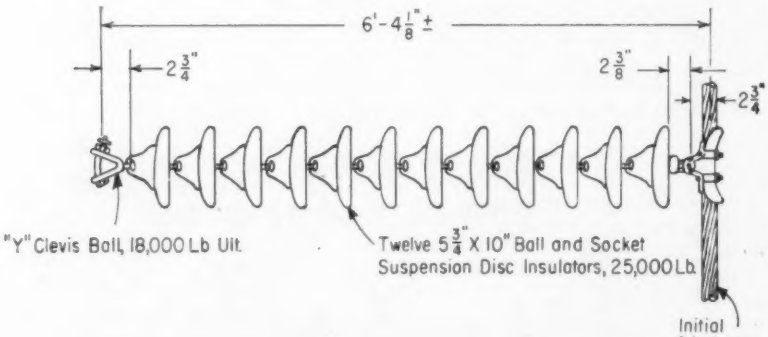

6'-4 1/8" ±
2 3/4"
2 3/8"
2 3/4"
"Y" Clevis Ball, 18,000 Lb Ult.
Twelve 5 3/4" X 10" Ball and Socket Suspension Disc Insulators, 25,000 Lb.
Initial Conductor

FIG 5—SIDE TENSION ASSEMBLY for deadend and other strain strings has twelve 5¾-by-10-in. ball-and-socket suspension disc insulators, 25,000-lb strength

used. These consisted of 1 or 2 cu yd of concrete dumped in a 30-in dia augered hole with an anchor rod properly placed in it and a channel plate on the end of the rod.

The vertically bundled conductors will be 12 in. apart except at deadends where they will be 18 in. apart. The second guy will be added on each deadend at the time the conductors are bundled. The initial guying on angle structures was designed to hold double conductors.

Make Flexible Joint

The conductor suspension clamps were selected to permit the use of a set of four short straps or connecting links to hold one suspension clamp below the other.

The pin through the upper clamp and socket-eye connector will be replaced by a threaded cotter bolt long enough to attach one link to each side of the clamp. The four links are bolted together below the top clamp to make a flexible joint, and the lower clamp is attached to the lower end of the two bottom links.

Before installing the second set of conductors the sags of the original conductors will be rechecked to assist in determining the probable maximum loading and tensions to which they have been subjected. It is then planned to prestress the new conductors to about this same value of maximum tension or perhaps slightly less, so that any further conductor stretching is likely to be the same in both conductors, or possibly slightly more in the lower one. After prestressing, the new conductors will be slackened off to the same sag as the upper ones and deadended in the same manner.

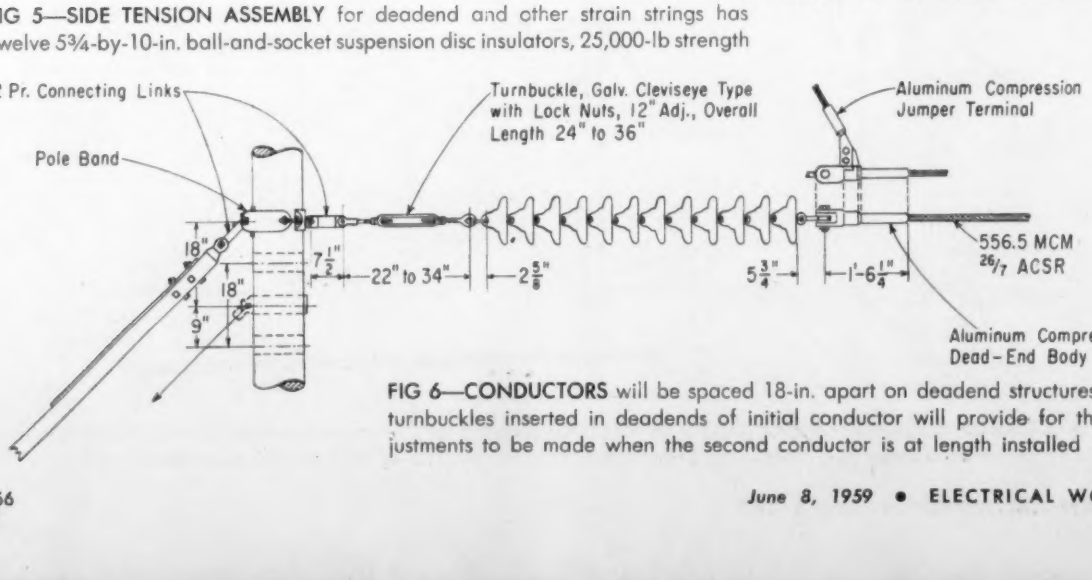
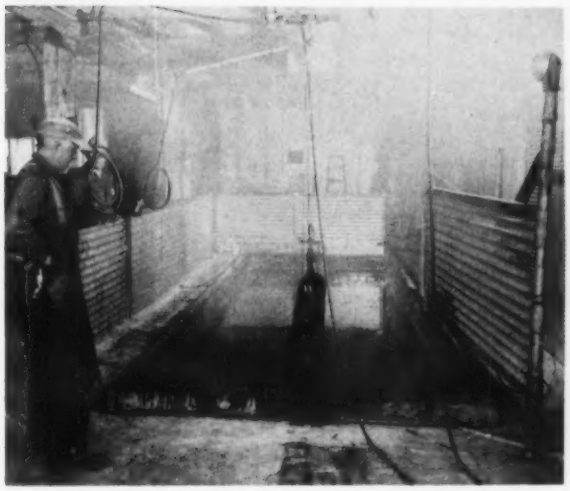
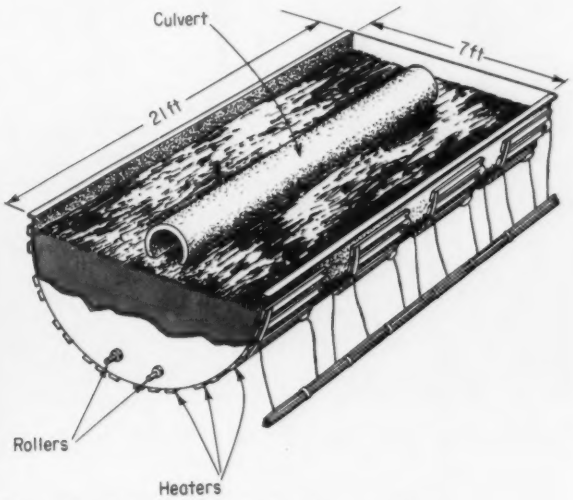


FIG 6—CONDUCTORS will be spaced 18-in. apart on deadend structures, and turnbuckles inserted in deadends of initial conductor will provide for the adjustments to be made when the second conductor is at length installed





Installed in old concrete pit and... heated by 72 strip heaters...

Dip Tank Cuts Production Cost, Boosts Business

GLEN J. ALDEN, Industrial Sales Engineer, Minnesota Power & Light Co, Duluth, Minn.

Increased production, trouble-free operation, and an exclusive product are the results of a new electrically heated dip tank at the Duluth Culvert Co, Duluth, Minn. Used to coat metal culverts with asphalt, the tank has cut production costs, and boosted the volume of business.

Previously the company had to ship the culverts 150 miles to be coated in a gas-fired dip tank. The culverts were then shipped back to the Duluth area, where they were sold. Shipping charges were eating up all the profits. The gas-heated dip tank was inefficient and constituted a serious fire hazard.

With an unused concrete pit available, the company decided to install its own dipping facilities. The pit was insulated and the dip tank set in it. Using 72 strip heaters, each rated 1,250 watts, the tank maintains a 400 F temperature with ease. Thus far electrical costs are about 50 cents per culvert. Moreover, the electric heating is very safe.

Since the tank was installed, the company has been unable to keep up with their orders. Part-time employees have been put on full-time. Many orders are from other culvert manufacturers.

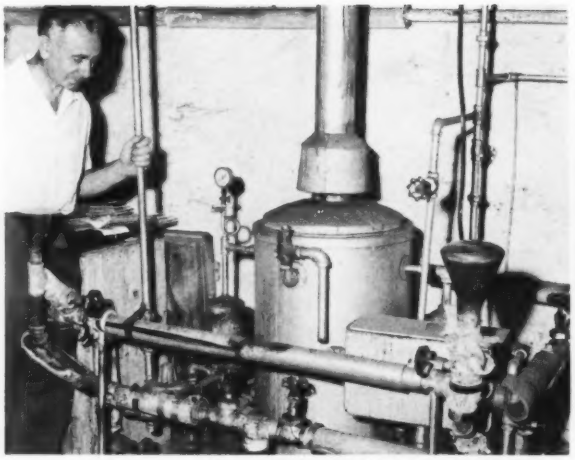
Measuring 21x7x3 ft deep, the tank holds 38 55-gal barrels of asphalt. Two sets of rollers, located one foot on each side of the center, allow rotation of the culverts.

Highly enthused about the successful operation, the plant management is now considering enlargement of the dipping operation and electrically heated gravity feed reservoirs for the dip tank.

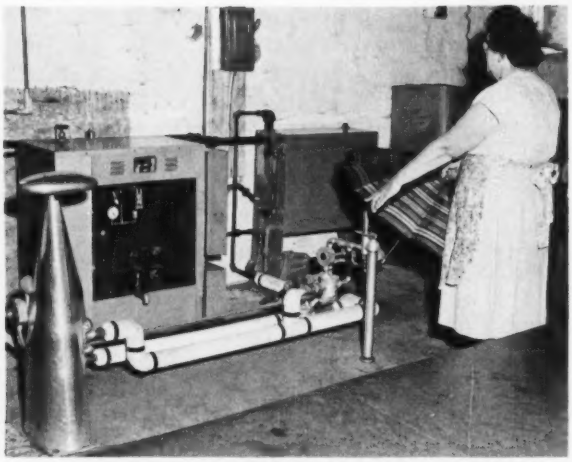
Heaters Aid Titanium Forming

Electric controls and electric heat play a vital role in a new process developed by Republic Aviation Corp, Farmingdale, N. Y., for forming titanium. Used in heat-resistant parts for supersonic aircraft, titanium must be softened by heat before it can be formed into the complex shapes required. Accurate control of temperature is essential to maintain the quality of the formed metal.

The easiest and most direct method is resistance heating. It eliminates large furnaces and saves both floor space and time. Key to the accurate control is a Servotherm pyrometer, which responds to the infra-red radiation from the heated body. Sensitive enough to detect heat from a man's finger at 200 yd under laboratory conditions, it is virtually unaffected by changes in ambient temperature. When the precise temperature needed is reached, the pyrometer gives a signal and the drop hammer is then released.



Replacing old gas-fired boiler with...



electrically heated steam unit...

Electric Way Reduces Maintenance And Fumes

J. A. BIDDING, Industrial Sales Representative, Pennsylvania Power & Light Co, Lancaster, Pa.

Replacing an old gas-fired boiler with a modern electric steam generator for process steam requirements has eliminated heavy maintenance requirements and speeded up steam finishing of umbrella coverings at the Lancaster, Pa. plant of Polan, Katz, & Co. Finished umbrellas are steamed, in an open position, to remove wrinkles and improve sales appeal.

The switch from gas-fired to electric steam generation resulted from the heavy maintenance requirements of the gas equipment. Severe scaling produced unwanted heat, developing sufficient fumes to require a vent installation in the area.

The new 22.5-kw electric steam generator has eliminated these problems and actually speeded up the finishing process by eliminating 50% of the heat-up time formerly required. With the increased steam rate, a 30% increase in production is anticipated.

Electric Mill Cuts Feed Costs $15 Per Ton

HOMER H. TURNER, JR., Industrial Power Engineer, Alabama Power Co, Birmingham, Ala.

Installation of an all-electric feed mill is saving John Bagwell, Alabama poultryman, from $12 to $15 per ton over the purchased price of processed feed. This 165.5-hp mill processes two tons of shelled corn per week to feed 1.1 million broilers and 150,000 breeders and replacements. A firm believer in the advantages of electricity, Bagwell also has a new air conditioned hatchery, with all-electric incubators, capable of producing 14,400 chicks weekly.

The mill and hatchery are served separately from 112.5-kva banks composed of three 375-kva, 13,000/480-v transformers. Combined maximum demand is 140 kw. Total power use per month is about 35,000 kwhr.

New Furnace Boosts Product Quality And Output

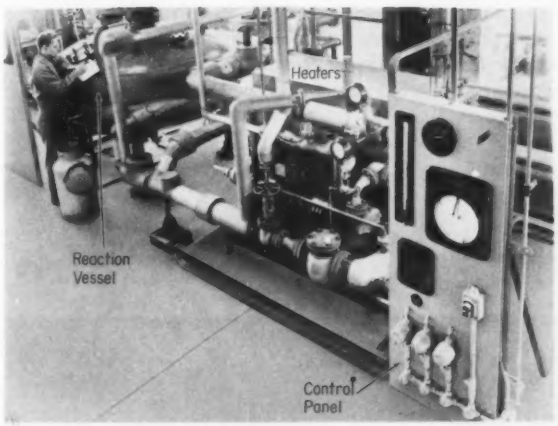
CHESTER G. FEESER, Industrial Power Representative, Baltimore Gas & Electric Co, Baltimore, Md.

Increased productivity and a better product are only part of the benefits of a new 42-kw electric furnace installed for annealing and normalizing at the Maryland Metal Spinning Co in Baltimore. The extra advantage is a new source of revenue.

Replacing old fashioned torch equipment, the furnace has improved the quality of the work, cut annealing time about 75%, and reduced associated labor costs to practically zero. In addition, its ample working capacity more than meets the company's needs and permits them to supplement their revenue by handling outside heat treating as an industrial service.

With the old torch equipment, it took a skilled man about four minutes to anneal each spinning. Though highly efficient with a torch, he produced work that was spotty compared with present results. The new furnace turns out 60 large pieces per hr – all of them uniformly heated and annealed. Automatic controls afford accurate heating and save the labor formerly required.

Reaction Vessel Heated, Cooled Electrically



Heating and cooling a jacketed kettle under unusual reaction conditions proved to be no problem for a unique packaged heating system installed at Hoffman-La Roche, Inc, Nutley, N. J. pharmaceutical manufacturers. Using electric resistance heaters and a hot oil transfer system, the 100-kw Hynes multi-pass unit raises kettle temperatures to 550 F under close control.

The unit operates at a maximum pressure of 50 psi, compared to the 700 psi that would have been needed if steam were used for heating. Explosion resistant requirements ruled out a gas- or oil-fired burner. When process cooling is required, the transfer oil is diverted through a built-in heat exchanger.

Heating elements are wired in units of 25 kw each for close temperature control and economical power use. The complete unit occupies less than 7x6x5.5 ft.

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.

Cost-Cutting Ideas for Industry

Ingenuity Is Key To Market Growth Problem

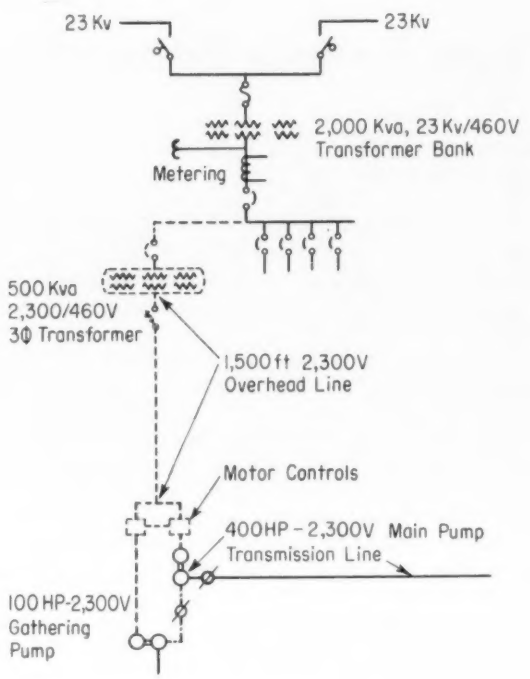
R. H. HARROD, Industrial Power Salesman, Duquesne Light Co, Pittsburgh, Pa.

Engineering ingenuity and efficient electric power, teamed up in an unusual power supply innovation, provided a low-cost solution to a product handling problem at the Ashland Oil & Refining Co's Valvoline Oil Div in Freedom, Pa. The installation enabled Valvoline to improve the flexibility of their pipelines to meet changing market conditions with a minimum first cost and operating cost.

When increased sales in one section of their market area, made it necessary to reverse the normal flow in the pipe line, a new 400-hp main pump and 100-hp auxiliary had to be installed at Freedom. With their own products available as fuel, their first thought was to use diesel pumps. There were several other obstacles to using electric power:

1. 2,300 v, the optimum voltage for a 400-hp motor, was not readily available. Service was purchased at 460 v. Because of the distance involved, it would be impractical to extend a 460-v line from the existing 23,000/460-v substation to the pump.
2. Extending the 23,000-v incoming line to the pump site and installing a second substation would be very expensive. Cost of service would be greater, too.
3. There was no room in the existing substation to add a second 23,000-v transformer to supply 2,300-v for the pump.
4. Load factor was only about 40%.

The solution was novel but effective. Since there was sufficient capacity in the existing 23,000/460-v substation to serve the pumps, it was suggested that a 460/2,300-v step-up transformer be installed and a 2,300-v feeder be extended from the substation to the pump site. A reconditioned 500-kva transformer was located and installed. The total cost of this scheme was less than any other considered and within the limits of the money that could be spent. Purchasing power at one point kept power costs to a minimum.

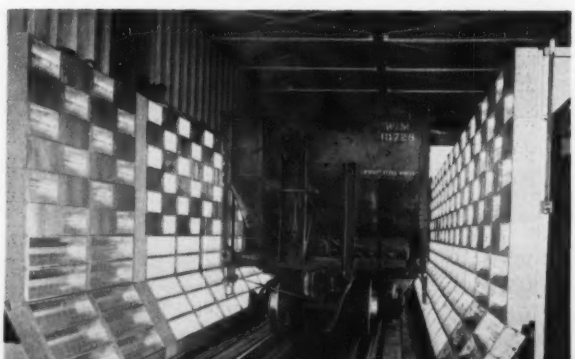


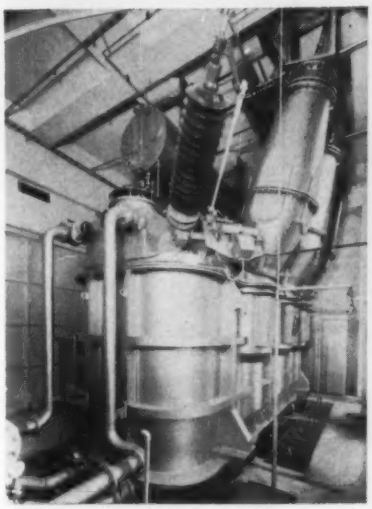
Installed in December, 1957, the system has assured a dependable power supply and enabled Valvoline to increase output with low capital expenditure, strengthening their position in a highly competitive market.

New Oven To Speed Unloading Of Frozen Coal

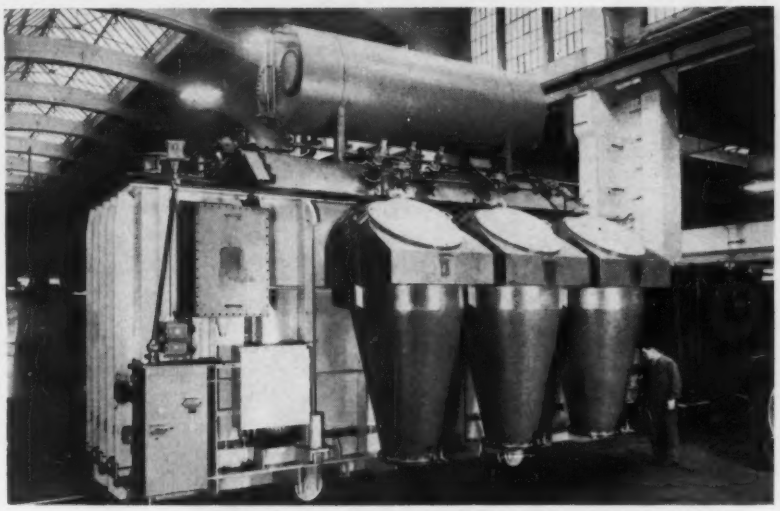
A new electrical method using quartz infra-red lamps to thaw frozen coal in railroad hopper cars is now in operation at the Western Maryland Railroad's dockside yards in Baltimore. According to railroad officials, the system is expected to provide less maintenance, greater speed and economy, increased cleanliness, and less damage to cars. Using banks of General Electric 1,600-w and 3,800-w lamps, the "lamp oven" has been under test this winter.

The cars enter the oven, built by Fostoria Pressed Steel Co, and pass between reflector panels of the lamps. Heaviest heat concentration is at the bottom of the car. GE engineers estimate that even in zero temperatures, at least six cars per hr can be unloaded without manual picking of the lading.





YBBS-PERSENBEUG unit has cable heads pointing toward vault roof



JOCHENSTEIN unit has cable heads pointing downward to connect with underground cables. Both units transform 10-kv generation voltage to 220-kv grid level

Terminal Boxes Replace Insulators

Vienna, Austria—(McGraw-Hill World News)—The Austrian ELIN Co has abolished pin-type insulators between cable terminals and transformer housings in two new installations. The design, developed because of space and transportation requirements, maintains insulation comparable with former designs.

In one case, the terminal boxes used in place of the insulators are pointed upward to connect the transformer with cables leading to the switching area. The installation, at the Ybbs-Persenbeug hydro plant, is directly under the surface of the road across the top of the dam. Cables extending from each of the three transformers, located on the north bank of the Danube, are laid within the dam's crown section to the switchyard on the south bank.

For the second unit, at the Jochenstein hydro plant, the transformers are located in open air, about 500 ft from the switchyard. Here the cable heads point toward the ground, because cables to the switchyard are laid underground.

The units differ further in that connections from the generator bus are mounted on the same side of the transformer as the cable heads on the Jochenstein unit. The Ybbs-Persenbeug unit has buses and cable heads on opposite sides in the conventional manner. Scarcity of space for the Jochenstein unit made the unusual mounting necessary.

Both transformers change 10-kv generation voltage to the 220-kv level of the transmission grid. The Jochenstein unit has a 35-Mva capacity; the Ybbs-Persenbeug unit, 45 Mva.

Tests Show Aluminized Guys Effective

E. B. **BRANT**, Product Manager, Page Steel and Wire Div, American Chain & Cable Co, Monessen, Pa.

Five years experience with aluminized guy strand in a climatically unfavorable area has indicated that the aluminum oxide film will not weather away in most atmospheric conditions. The ⅜-in. 1x7-strand withstood corrosive atmospheres in Western Pennsylvania and West Virginia without deterioration.

Several exhaustive tests showed no loss of the strand's physical properties. When installed, individual wires were 0.119 in. in diameter. The strand breaking strength was 11,500 to 11,525 lb, and coating was 0.27-oz-per-sq-ft aluminum.

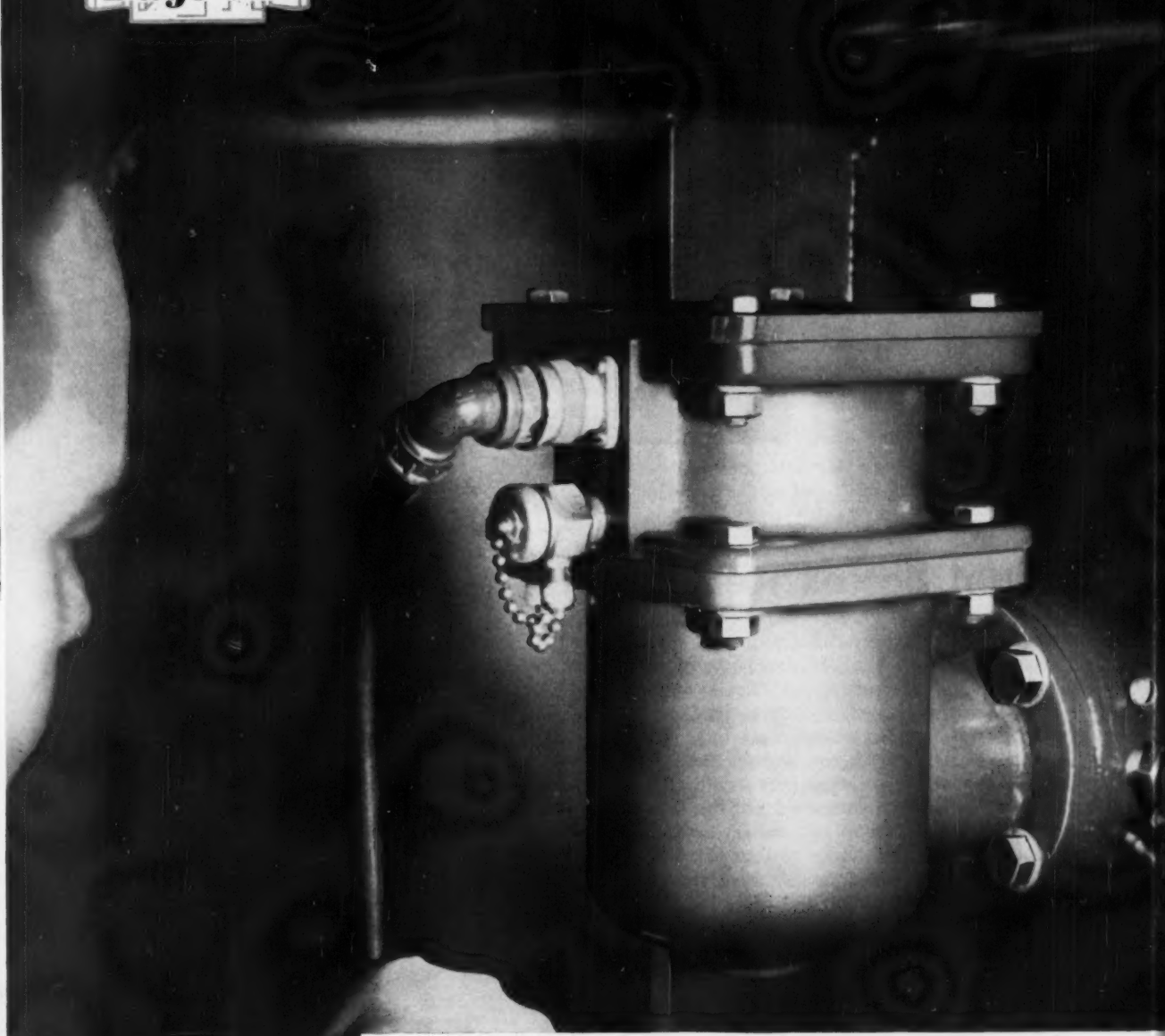
After the five-year test, both the center and outside wires were gauged at 0.120 in. Tensile strength was calculated at 152,800 psi for the center wire and at 153,000 psi for the outside wires. Coating weight was 0.29 oz per sq ft of aluminum for the outside wires and 0.27 oz per sq ft of aluminum for the center wire.

Microscopic measurements of the coating were made at about 500 magnifications. They indicated negligible loss of aluminum coating during the five years of exposure.

The aluminum coating is applied by a hot-dip method. Contact with air converts the surface to a transparent film of aluminum oxide.

Progress that Pays Off

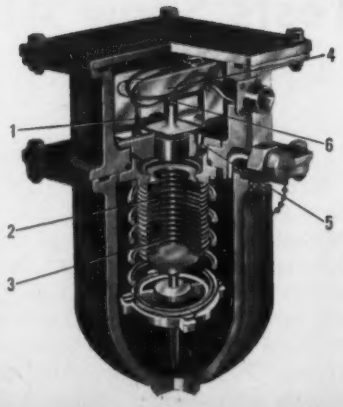
NEW GENERAL ELECTRIC TYPE J FAULT PRESSURE RELAY GIVES . . . . .



HERE'S HOW IT WORKS

The Type J-Relay responds to the oil shock wave or rapid rise of oil pressure produced by an internal fault. The shock is transmitted to the piston (1) via the bellows (2) and silicone oil (3) in the lower chamber. The piston operates the switch (4) signalling the circuit breakers to open.

Two features help prevent false tripping. Equalizing holes (5) permit passage of silicone oil when transformer operating pressure varies. The J-device is thereby equally fault-sensitive regardless of operating pressure level. Also, special gap (6) between piston and switch guards against relay operation due to system surges and through faults.



Fast, Effective Fault Protection for Power Transformers

HELPS PREVENT EXCESSIVE DAMAGE AND REPAIR COSTS, MINIMIZES SYSTEM DISTURBANCES IF A TRANSFORMER FAULT OCCURS

Power transformers seldom fail today. However, if an internal fault does develop, system disruptions and transformer damage (and thus repair costs) can be minimized by rapidly de-energizing the unit. The new General Electric Type J Fault Pressure Relay is designed to trip circuit breakers by quickly responding to the abnormal rise in oil pressure produced by a fault. The relay is recommended for all power transformers to supplement differential relays.

ADVANTAGES OF THE NEW J-RELAY ARE:

Rapid Fault Sensitivity because the relay responds to the full pressure wave transmitted by oil. Operation will occur whenever the rate-of-rise exceeds 0.5 psi/sec. For major faults, operation will occur in less than one cycle.

Constant Accuracy at all transformer operating pressures. A pressure equalizing or differential feature permits the relay to compensate for normal pressure variations which could otherwise bias its operation.

Guards Against False Tripping which could result from system surges, through-faults, mechanical shocks and vibration. Special design features and the mounting position in oil, where the relay responds to the primary fault pulse, help prevent false operation.

Full Accessibility for inspection or testing as desired. The relay is located on the tank wall near ground level and can be removed, if ever necessary, without de-energizing the transformer.

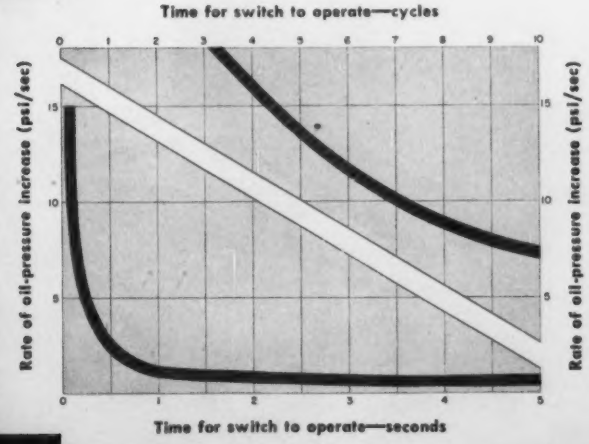
Economical, Effective Protective System results from joint use with gas-detector relay which warns of incipient faults.

The price of this relay on your next G-E power transformer is $350—a small price when compared with possible repair-cost savings alone. For further information, contact your General Electric Apparatus Sales Engineer or write for bulletin GEA-6916 to General Electric Co., Section 421-58, Schenectady 5, N. Y.

Progress Is Our Most Important Product

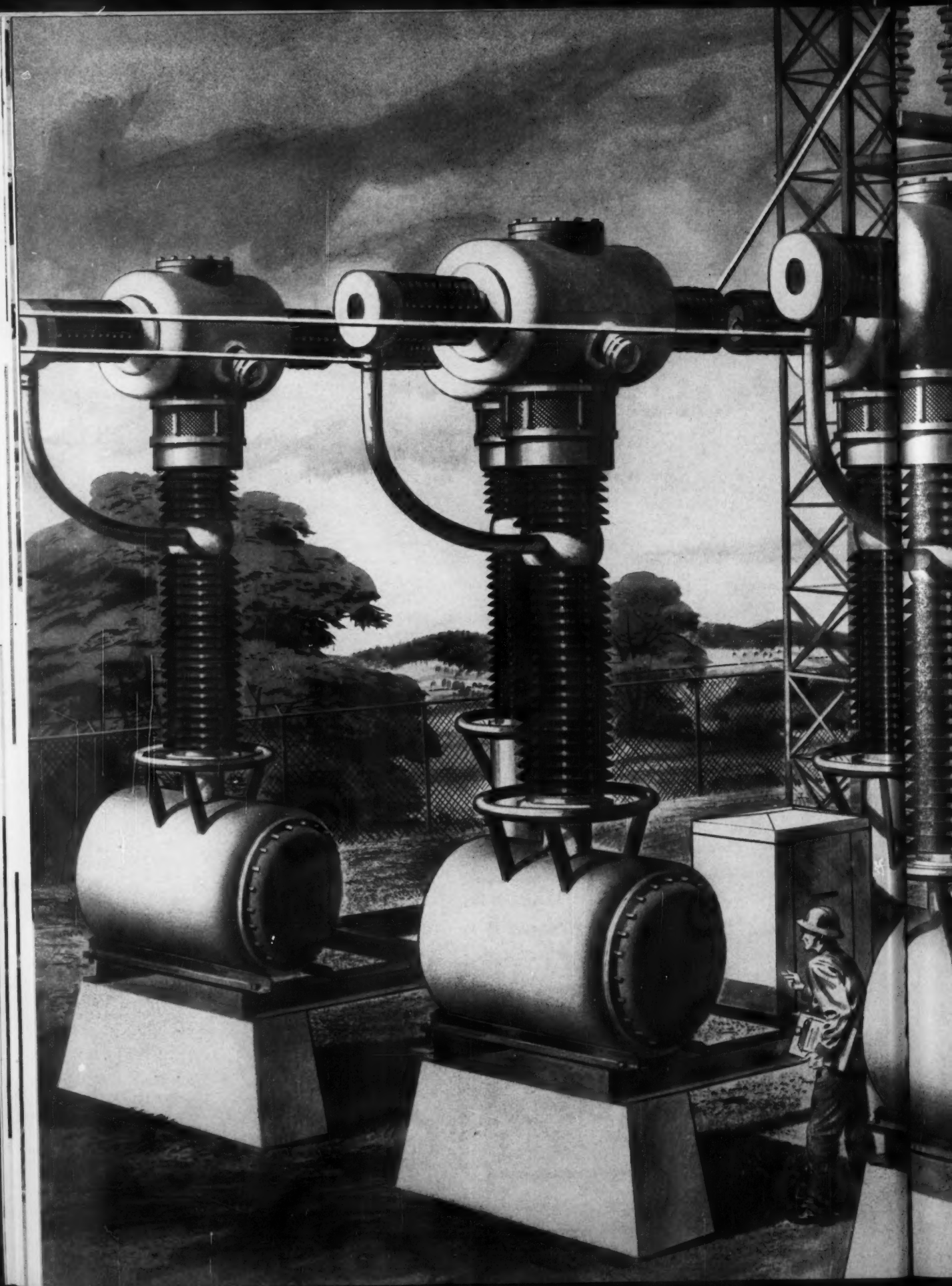
GENERAL ELECTRIC

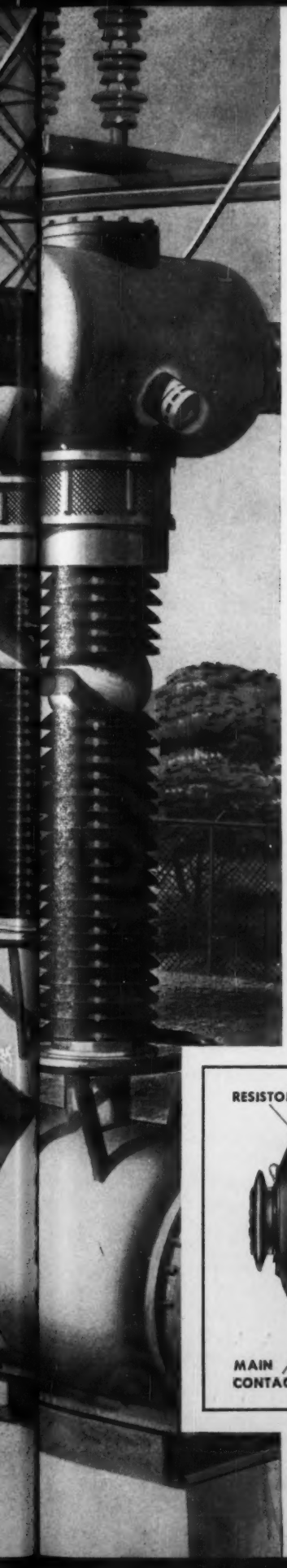
RAPID OPERATION—Time vs oil pressure (rate-of-rise response) curve illustrates quick relay operation. Pressure increases shown are those in primary medium—transformer oil—where shock wave is greatest.


Time for switch to operate—cycles
Rate of oil-pressure increase (psi/sec)
Rate of oil-pressure increase (psi/sec)
Time for switch to operate—seconds

UNIVERSAL APPLICATION—Operating in oil, the new G-E Type J relay can be used on all power transformers, regardless of oil preservation method, including those with the superior Atmoseal* system.

* Trade-mark of General Electric Company.





NEW General Electric AIR BLAST Power Circuit Breakers offer you . . .

• 75% maintenance reduction
• Flexible, less costly installation
• Practical super-voltage protection

General Electric's new Type ATB Air Blast Power Circuit Breakers offer you economies never possible with oil breakers. For instance, Type ATB breakers require maintenance only about one-third as often, and cut inspection time 75% when they do. Time saving of this magnitude permits you to re-evaluate the need for stand-by breakers, perhaps even eliminate certain by-pass circuits.

Installation Costs Slashed

Easier, more flexible, less costly installation is another inherent benefit of General Electric's new Air Blast design. Units are 30 to 50% lighter than comparably rated oil breakers, and, since they do not produce impact loading during interruption, they can be installed on switch structures or even on top of buildings to save space. When breakers are conventionally mounted, foundation piers are considerably smaller.

The Key to Super Voltage Transmission

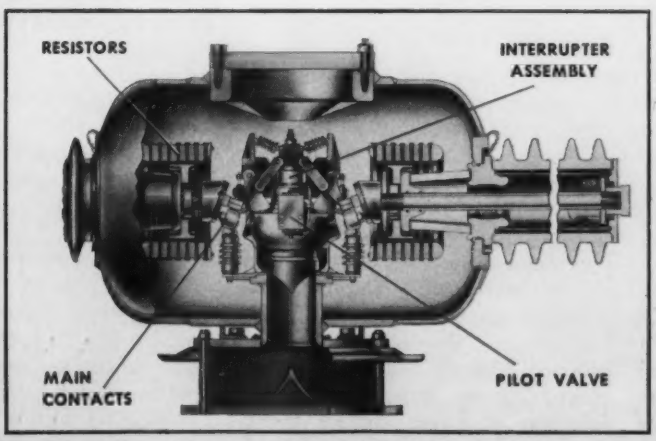
Air Blast breakers of any conceivable transmission voltage rating can now be built, removing a major stumbling block in the way of super-voltage transmission.

The key to increased breaker voltages is a new modular interrupter head which stores high-pressure air, ready for use the instant the contacts part. Ratings above 115-kv are built by simply adding interrupter heads in series. This modular design permits mass production techniques; ultimately will be reflected in lower first costs.

Type ATB breakers are available now in ratings from 115- through 460-kv and beyond. Ask your General Electric Sales Engineer to tell you about all the outstanding benefits these breakers provide. General Electric Company, Schenectady 5, New York. 494-1

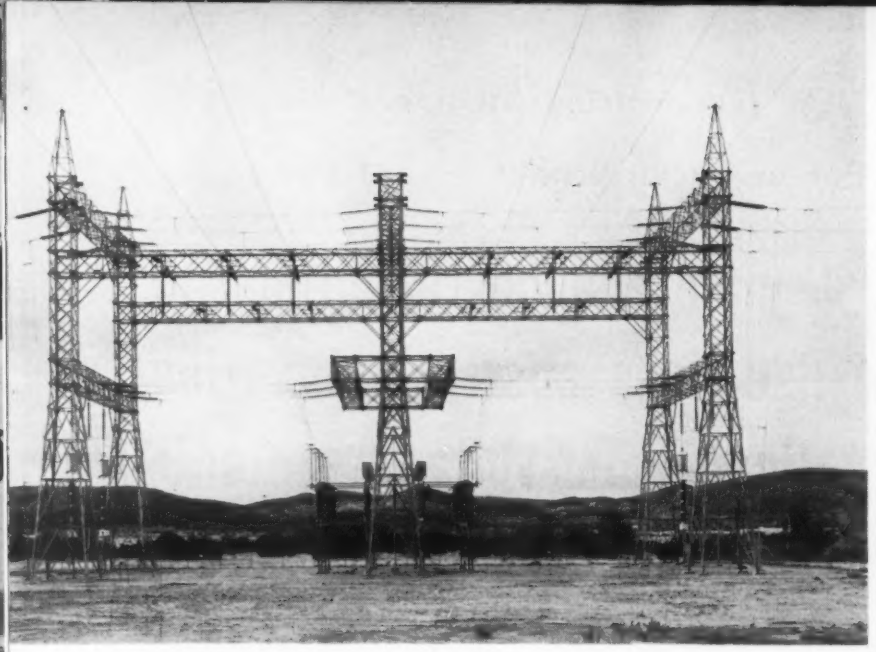
Progress Is Our Most Important Product

GENERAL ELECTRIC



MODULAR INTERRUPTER HEAD is utilized in all ratings of Air Blast line. High-pressure air is stored right at the contacts, provides interruption in three cycles or less.

ROUTINE INSPECTION of Type ATB Breakers is quick and easy. Swinging aside interrupter access cover exposes contacts.



U S BUREAU OF RECLAMATION LINE comes in at the left and goes out at the right of photo. Double takeoff between vacuum switches goes to what will be main and transfer buses for the tap line switching structure in the system

Vacuum Switch Interrupts 230 Kv

Proves suitable for sectionalizing duty on 140-mile circuit, and has lower first cost than an oil circuit breaker

W. E. CAMPBELL, Senior Engineer, Substation Design Section, Arizona Public Service Co, Phoenix, Ariz.

The first 230-kv application of vacuum interrupter switches proved satisfactory for line and load-dropping duty for Arizona Public Service Co.

The installation has two Schwager-Wood 230-kv, 600-amp switch sets, one on either side of a load tap to the U. S. Bureau of Reclamation Davis Dam-Prescott 230-kv line. This circuit, tying the Colorado River Parker-Davis Project and central Arizona, is part of a transmission loop.

The Public Service Round Valley tap serves a natural gas compressor load, about 12 Mva and potentially bigger, with a high continuity requirement. Maintenance, possible on the untapped line by dropping the 140-mile line, now requires sectionalizing by dropping half the line at the tap to avoid de-energizing the tap load.

Service continuity to the load could not economically justify oil circuit breakers for sectionalizing, and ordinary disconnecting switches could restrike on dropping the 70 miles of line in either direction. A study showed that for a fraction of the cost of the OCB installation, supervisory-controlled, motor-operated vacuum interrupter switches would operate well within their capabilities.

The switch units are a conventional rotating-insulator, vertical-break, 3-pole disconnect switch with an interrupter of eight Jennings Radio vacuum tube units in series on the hinge end of each pole. Arc interruption in the vacuum units provides such quick re-establishment of dielectric strength that restrikes can't occur.

No Arcing Visible

The switches were tested initially for line dropping duty immediately after installation and adjustment. Typically, the system loop was broken by the USBR OCB at Prescott or Davis Dam, and the line section in that direction was dropped by motor-operating the vacuum switch interrupter. During these tests, no arcing was visible. An oscillogram showed 21 Mvar dropped without disturbance, and ground current, indicating a slight variation of phase contact break time, disappeared within 1 cycle.

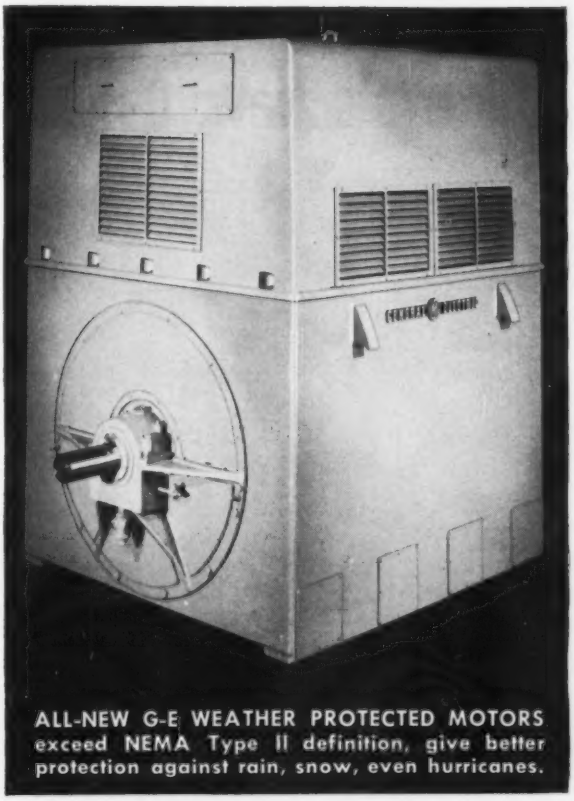
Normally, the switches would not be expected to break the system parallel. Yet to test their ability, one interrupter was used to drop about 70 Mva load. The oscillogram indicated clean interruption, with only slightly more ground current.

In further tests on the system for energizing the line through the switches and for paralleling the system, the vacuum interrupter units were not involved, as they close at the end of the opening cycle, the duty being entirely on the conventional disconnect switches. After installation of main contact barriers, this operation was repeatedly successful.

Public Service's 230-kv OCB at Round Valley is controlled by impedance relaying for protection of the 35-mile tap circuit and transfer tripping by carrier for protection of the gas compressor substation. Carrier coordination between Public Service and USBR blocks tripping of the main line on tap line fault. In event of a main line fault and an unsuccessful reclosure by supervisory, the line is sectionalized at Round Valley by the new switches, and tested to locate the faulted section, an operation not involving the switches' line-dropping ability. The switch motor-operators are supplied from the station battery, charged by 138-kv PT's with a 5-kva thermal rating, which are connected line to ground.

FROM GENERAL ELECTRIC . . .

New Custom-designed Power Station Motors Provide Better Protection, Easy Maintenance



ALL-NEW G-E WEATHER PROTECTED MOTORS exceed NEMA Type II definition, give better protection against rain, snow, even hurricanes.

Now, you can get a new General Electric motor custom-designed for your specific power station requirements. Nine custom-designed enclosures—eight custom-designed insulation systems—seven custom-designed bearing and end shield constructions—more than 15 custom-designed accessories—and a countless number of electrical designs: these give our engineers freedom to create a power station motor that can meet your exact needs. General Electric's all-new weather protected motor, shown at left, is one example of how a motor can be custom-designed for its particular application.

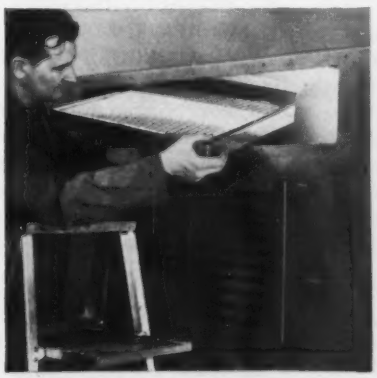
CUSTOM-DESIGNED FOR BETTER PROTECTION—Unique labyrinth baffling system of new weather-protected motor forces incoming air to make a series of right-angle turns and reductions in velocity before entering motor. And, special "blow-through" passages give extra protection against high-velocity winds.

CUSTOM-DESIGNED FOR EASY MAINTENANCE—New end shield is lightweight, easy to remove and disassemble, eliminating need for crane or lifting rig. Vistamatic sight gages are located on top and both sides allowing oil ring observation and easy reading of oil level.

CUSTOM-DESIGNED FOR GREATER ACCESSIBILITY—Removable top section provides access to all air passages and baffles for easy inspection, maintenance. Motor windings and bearings are easy to reach because of new end shield which is lightweight and easily removed.

FOR MORE INFORMATION on General Electric custom-designed power station motors, contact your nearby G-E Apparatus Sales Office or write to Section 884-1, General Electric Co., Schenectady, N.Y.

GENERAL ELECTRIC



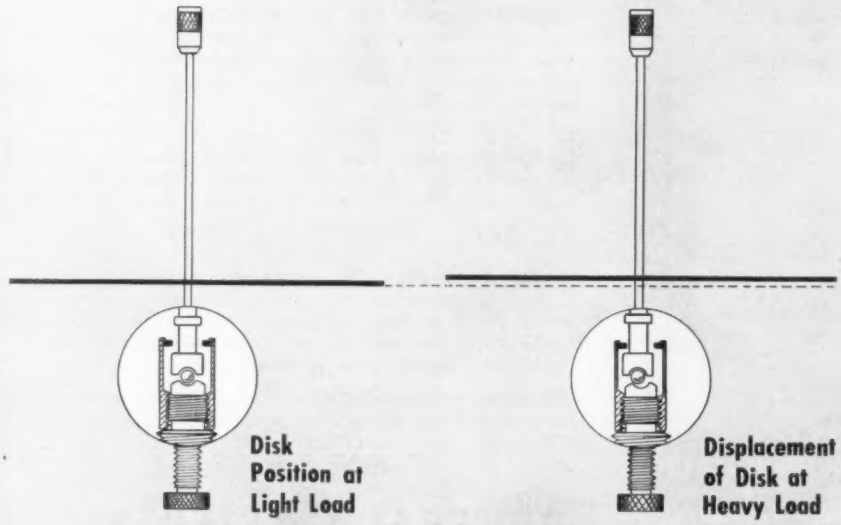
TOP ACCESSIBILITY—Air passages in top section are completely accessible through nine openings. Filter installation or inspection is fast and easy.

BETTER PROTECTED AIR OPENINGS—"High up" air intake passages of new G-E motor prevent snow, trash, dust or dirt from being drawn into the motor.

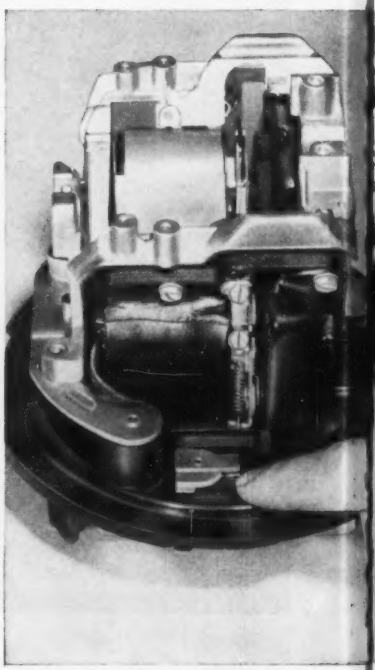
SIMPLIFIED MAINTENANCE—Removable, lightweight end shield permits complete accessibility to motor interior, bearings without disturbing alignment.

5 WAYS

Here's Why General Electric's New, Complete



OLD-STYLE BALL-BEARING SYSTEM



1 MAGNETIC SUSPENSION ASSURES ACCURACY THROUGH FULL METER RANGE—With conventional ball and jewel bearing system, higher loads can force the disk out of position and cause inaccurate meter readings. Because the disk in General Electric polyphase meters floats free, there's never a danger of disk displacement at any load . . . meter readings are accurate through full meter range.

In addition, because there are no ball bearings in G-E's magnetic suspension system, you eliminate bearing inspection, cleaning and replacement costs. You also minimize revenue losses because this free-floating system reduces friction-caused tilt errors.

2 COORDINATED INSULATION SYSTEM PROVIDES MAXIMUM SURGE PROTECTION—Exclusive series gap design, with magnetic blowout, offers best protection against lightning and other surges. Flashover is controlled and the resulting arcs extinguished within ½-cycle by this unique gap design.

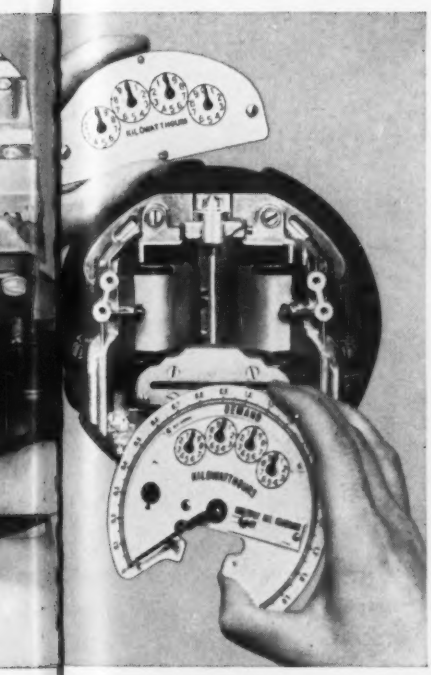
THESE FIVE EXCLUSIVE FEATURES, together with unexcelled load and power factor performance, combine to make the General Electric V-60's your best meter buy.

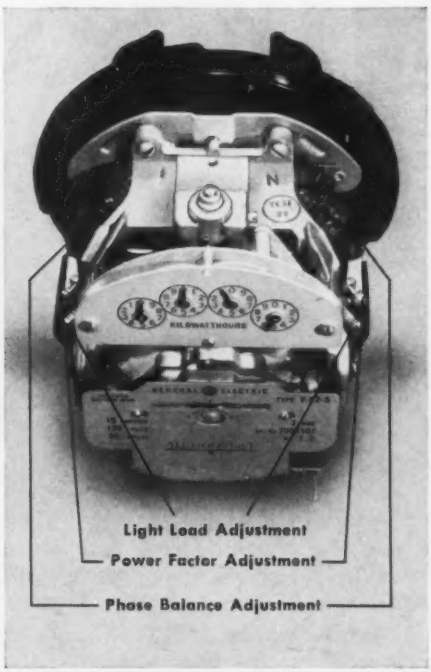
There's a G-E V-60 meter to handle every Class 10, 100 or 200 two-stator polyphase application. Depending upon your needs, specify the V-62 (network and 3-wire, 3-phase), V-63 (3-wire, 3-phase), V-65 (4-wire Y, 3-phase), or the V-66 (4-wire △, 3-phase).

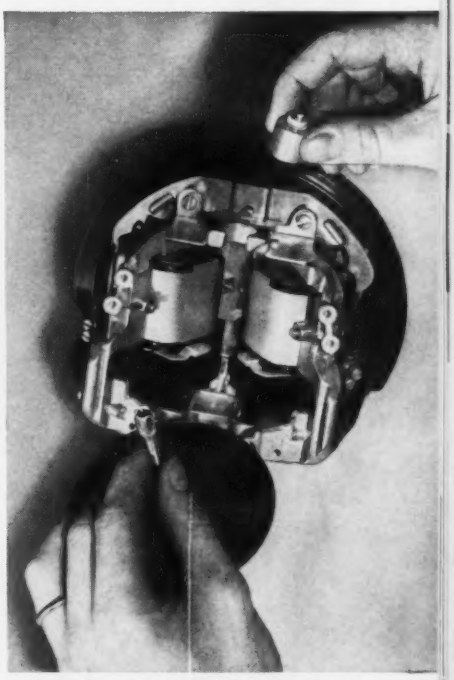
FOR COMPLETE INFORMATION on G-E's new V-60 polyphase meter line, contact your nearest G-E apparatus sales representative or write General Electric Company, Section 628-28, Schenectady 5, N. Y.

BETTER

V-60 Polyphase Meter Line Is Your Best Buy!







3 NEW POLYPHASE METER LINE GIVES YOU GREATER VERSATILITY – V-60 meters accommodate either kilowatt-hour or demand registers without use of adaptors or intermediate gearing. Any G-E demand register manufactured in the last ten years can be used on V-60's as well as on any other G-E meter.

4 ONLY V-60 METERS OFFER COMPLETE, INDIVIDUAL STATOR ADJUSTMENTS—General Electric's advanced V-60 design provides complete vernier adjustments on each stator for all polyphase load conditions. Meters you receive are precisely calibrated for optimum performance. Only one of the light load adjustments is required for normal calibration "touch-up."

5 EXCLUSIVE "V" STATOR DESIGN SIMPLIFIES FIELD MODIFICATION—Because of G-E's unique "V" stator design, disk and shaft assembly can be removed to accommodate contact devices and detents without disassembling meter. Precisely doweled magnet location eliminates need for recalibration.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Get . . . and Keep Materials Under Control

This is the third in a three-part report on the recent Edison Electric Institute Purchasing and Stores Committee meeting held in St. Petersburg, Fla. Earlier parts were carried in the issues of May 25 and June 1.

Proper material control management can help keep your company efficient and economically sound, said W. B. McClelland, Consumers Power Co. Management of material control, he added, is simply the method of applying known practices of controlling purchasing and storekeeping functions. However, McClelland cautioned, "Each company, regardless of size must find the combination of basic principles which best fit its operations."

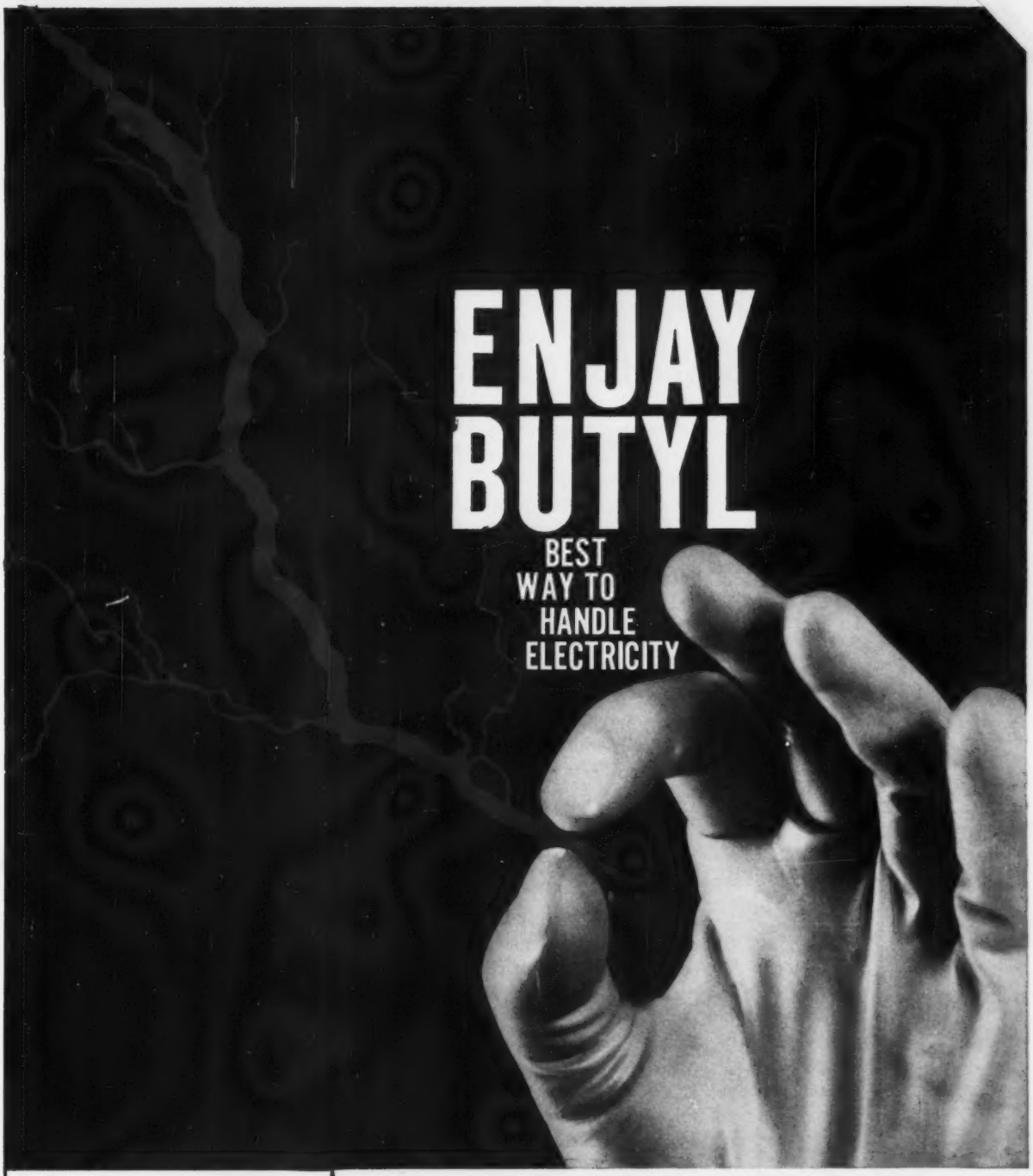
When starting from scratch on a material controls program first determine what you want to accomplish. Then decide what machinery will be needed and if the resulting saving will justify the projected expense. While doing this, said McClelland, also determine: (1) If this function can be added to the machines or whether accounting and engineering can benefit from other reports; (2) If overall operations will be improved; (3) If the equipment should handle future growth of present operations and (4) What modification of plant and equipment will be required to install such a system.

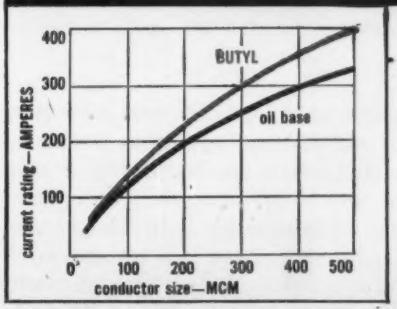
Problems peculiar to utilities must be considered in outlining objectives. McClelland described these as: The great variety of material stocked; the proper recording and disbursement of material in round-the-clock utility operations; reconciling centralized accounting with the need of local records in storerooms; the necessity of taking inventory without disrupting business in general; and the wide fluctuation of requirements with construction schedules.

In light of these, inventory control management should seek to:

- Meet construction and operating schedules by maintaining an orderly flow of material.
- Maintain proper distribution of materials among storerooms.
- Control the addition of new items and maintain records indicating application and anticipated consumption.
- Locate and recommend disposal of stock.

(*Continued on page* 82)





Butyl's outstanding resistance to heat allows considerably higher currents for any given conductor size.

Of all vulcanizable rubbers, Enjay Butyl offers the best electrical and dielectric properties. Butyl is the ideal material for wire and power cable, transformers, tapes, busbars and other insulation applications.

Butyl *also* offers outstanding resistance to weathering and sunlight . . . chemicals . . . abrasion, tear and flexing . . . superior damping properties . . . unmatched impermeability to gases and moisture.

Find out how this versatile rubber can improve your product. Call or write the Enjay Company, today!

ENJAY®
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ENJAY *Pioneer in Petrochemicals*

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To make material control work, McClelland suggested the department should be responsible for screening all requisitions for new material, for purchase order follow-up, for transfer of material between storerooms and for editing and verifying specifications and descriptions by comparison with like items and with manufacturer's catalogs. The question of who should be responsible for issuing authorization for new stock items, McClelland commented, ". . . is debatable." However, he added, "It is our feeling that the authorization form showing quantities, specifications and application is a joint responsibility of the material control section and the engineering and using departments."

Buying-Stores Cooperation Can Save $$$

Key to improving buying-stores relations is effective communications. C. L. McCamey, Cleveland Electric Illumination Co, stressed this point in his report on a project group activity. Because of the direct effect which one activity has on the other, the need for thorough understanding and communication between Purchasing and Stores in a utility operation is essential.

But there are plenty of other areas for cooperation which can improve efficiency and trim expenses in both the purchasing and stores activities. McCamey, speaking for his project group, offered suggestions in these areas:

Transportation and handling costs—these take a big bite out of the stores expense dollar (see EW, June 1, p 60). With the proper records and possibly a joint purchasing-stores staff to study them, it might be possible to determine whether a utility is using the most economical methods available through common carriers. It would certainly be possible to determine and study the per-miles or per-hour cost of intra-company hauling. And it might be possible to determine the most feasible delivery location for materials of various kinds.

Materials testing—there's money to be saved in this area, too. It was significant that only three of the seven companies surveyed gave any consideration to the cost of testing items in deciding the quantity and delivery location of an item ordered. Determination of the actual cost of each test made may point to more economical means of carrying out the test operation. Remember this cost is a part of the total value of the material delivered to other departments.

Practical packages is an area where real dividends can result from buying-stores cooperation. Yet relatively few companies have gone much beyond the acceptance of EEI-NEMA standard packages. The project committee suggested a formal packaging program for every utility. Way to start is consider the end use and user operation first. Also to be considered is the handling, breakage, and deterioration problems. But for real checking, you need a feed-back system to make sure that the handlers and users are getting what they need to improve their efficiency.

Forecasting material needs may be the single most important area for buying-stores cooperation. Accurate forecasts of material and equipment needs must precede efficient buying and storing. Generally, there has been plenty of information—but too often it comes too late and is too inaccurate for optimum control. What is needed here are formulas for interpreting kwhr sales in terms of poles, insulators, cutouts, cross arms and the like. And it is not impossible. A study at Cleveland Electric Illuminating Co showed a definite correlation between sales forecasts, manhour forecasts, and material use broken down into material associated with the various classes of sales.

Our business is to help you

distribute the wealth!

Generating facilities are simply capital investment until the wealth they create in the form of power, is distributed to customers. Your big job is to keep pace with community growth by extending and enlarging your lines quickly as needs arise. With population continually increasing . . . with more and more new homes being built . . . with national average family income rising; and with manufacturing and industrial plants continuing to look to suburban areas for plant sites, you're going to have expansion problems for many years to come.

VICTOR CAN SIMPLIFY YOUR JOB

By choosing your distribution requirements from VICTOR, you automatically save time and money. You eliminate a lot of paper work and uncertainty. By choosing VICTOR, you are *sure* you're getting insulators and hardware that have been thoroughly tested and proven before they go on your lines.

FOR THE LONG HAUL

After several decades of service on lines all over the country VICTOR's High Voltage Pintype Insulators have proven themselves ideal for lines up to 66KV. They're easy to install, inexpensive, and have an amazing ability to perform under the most adverse conditions of service. Specifications on Page 23, VICTOR Catalog No. 56.

VICTOR No. 245 R
(EEI-NEMA 56-3)
TRANSMISSION PINTYPE

FOR SHORT HAULS AT LOWER VOLTAGE

No VICTOR insulator for *any* service is made with greater care than these low and medium voltage pintypes. The same careful manufacturing, quality control and testing procedures are used as in the manufacture of VICTOR insulators designed for EHV. There's no better distribution pintype made—at any price. Every one is a premium-grade unit. Listed on Pages 15 and 16, VICTOR Catalog No. 56.

VICTOR No. 6R
(EEI-NEMA 55-4)
LOW VOLTAGE PINTYPE

FOR DEAD-ENDING OR TURNING A CORNER

Under this type of service the VICTOR 6" Suspension (No. 804) is ideal. Withstanding better than 10,000 lbs. of pull, it has a margin of safety that overcomes hazards of ice and wind loading. On pages 27 and 28 of our Catalog 56, VICTOR Suspensions are shown together with specifications.

VICTOR No. 804
(EEI-NEMA 52-1)
6" SUSPENSION INSULATOR

GUY STRAINS AND SPOOLS

VICTOR No. 2012
(EEI-NEMA 53-2)
SPOOL INSULATOR

VICTOR No. 506
(EEI-NEMA 54-3)
GUY STRAIN INSULATOR

These insulators are made of the same Purified Porcelain as every other VICTOR insulator. They are just as carefully manufactured and inspected as the highest voltage insulator we make. VICTOR guy strains and spools have a smoothness of glazed grooves that is unsurpassed. And their mechanical and electrical values far exceed those established by EEI-NEMA. Listed on pages 19 and 21 of VICTOR's Catalog 56.

DISTRIBUTION HARDWARE

VICTOR carries a full line of distribution and transmission hardware manufactured in malleable iron, forged steel and aluminum and cast aluminum. See our Catalog 56, pages 43 to 57.

VICTOR No. 2050
DISTRIBUTION CLAMP

For specialized information concerning VICTOR Distribution Insulators and Hardware, write I-T-E Circuit Breaker Company, Victor Insulators Division, Victor, New York.

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION

Westinghouse Readies Rotor for Con Ed's Nuclear Plant

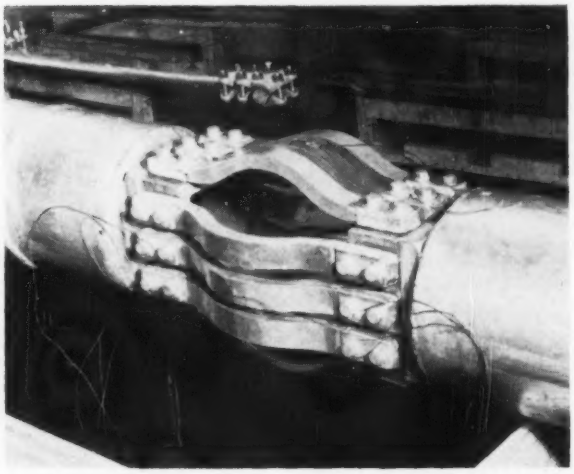
Rotor winding is nearing completion for the 330-Mva turbine-generator to be installed at Consolidated Edison Co's Indian Point nuclear power plant. This 1,800-rpm inner-cooled generator is the largest unit of this speed built by Westinghouse Electric Corp. It is scheduled to be shipped in late 1959.

Steam conditions are 355 psig, 1,000 deg F, 1.0-in. Hg absolute. At maximum load, the turbine will pass 2.2-million lb of steam per hr. Because of the large volumetric flow to the turbine exhaust, double-flow 44-in. low-pressure blades are used.

Anderson Custom-builds 16-Inch Flexible Connector

This flexible expansion connector was custom-built by Anderson Electric Corp for Houston Lighting & Power Co. It will connect 16-in. OD aluminum tubing for main generator leads. The connector, shown here in a heat rise test, is limited to a 30 C rise above 40 C ambient at 12,000 amp.

Each 147-lb connector consists of 16 laminated aluminum shunts, the ends of which are welded together by the Heli-Arc process to insure even current distribution. The shunts are bolted at both ends to two cast aluminum alloy plugs welded into the tubing. Each 19½-in.-long shunt is composed of 27 aluminum strips $\frac{1}{32}$-in. thick.

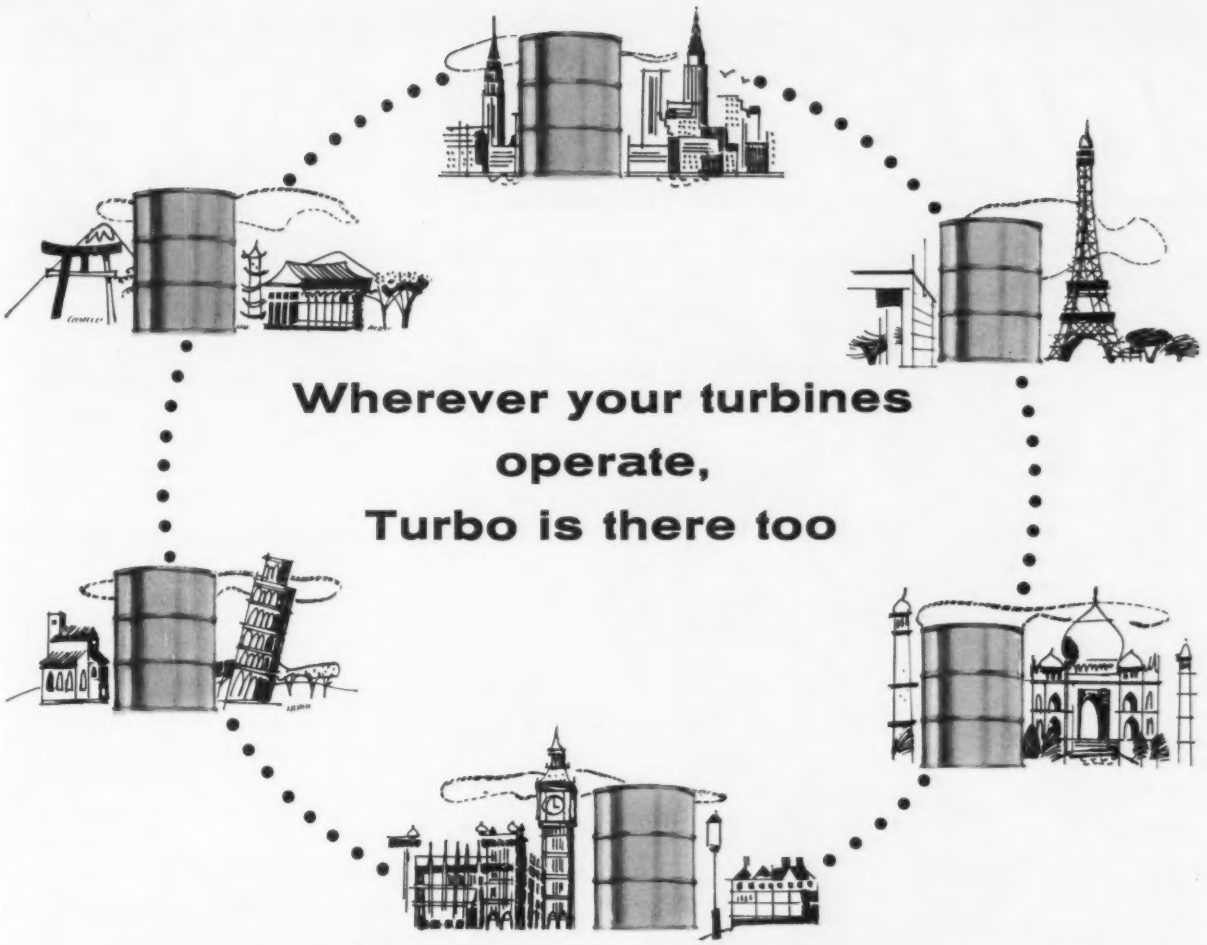


Penn Transformer Ships Its Largest Unit—315 Mva

Keeping pace with demand for larger and more powerful transformers, Pennsylvania Transformer Div, McGraw-Edison Co, recently shipped the highest-capacity transformer the company has made—a 315,000-kva unit for Wisconsin Electric Power.

The transformer was shipped in one piece on a conventional depressed-center railroad car, with only the bushings and other accessories removed. The unit will step up a generated voltage of 17.2 kv to 230 kv.

(*More News of Manufacturers, p* 86)



Wherever your turbines operate, Turbo is there too

Its performance and name are the same around the world

Other outstanding Shell Industrial Lubricants

Shell Tellus Oils—for hydraulic systems

Shell Alvania Grease—multi-purpose industrial grease

Shell Rimula Oils—for heavy-duty diesel engines

Shell Talona R Oil 40—anti-wear crankcase oil for diesel locomotives

Shell Dromus Oils—soluble cutting oils for high-production metalworking

Shell Macoma Oils—for extreme pressure industrial gear lubrication

Shell Voluta Oils—for high-speed quenching with maximum stability

Shell Turbo Oil is now available to your customers in foreign countries. Because of this universal availability, you can be sure your equipment will give the same performance that your domestic customers enjoy.

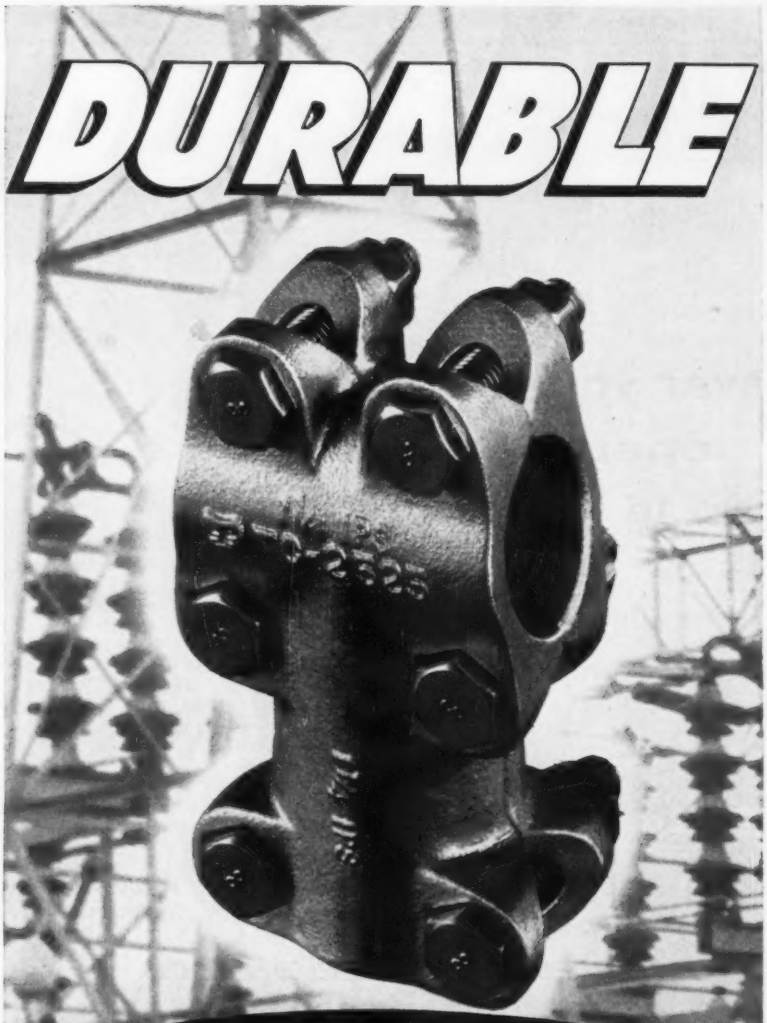
Turbine-manufacturers' and turbine-users' reports prove that Shell Turbo® Oil is outstanding in oxidation stability and rust protection. In addition, this oil has special properties to insure adequate lubrication of the highly loaded gears in ship propulsion and industrial applications.

Wherever your turbine equipment is installed, make Shell Turbo Oil your standard recommendation. For more complete information, write Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

SHELL TURBO OIL

the universally preferred turbine lubricant

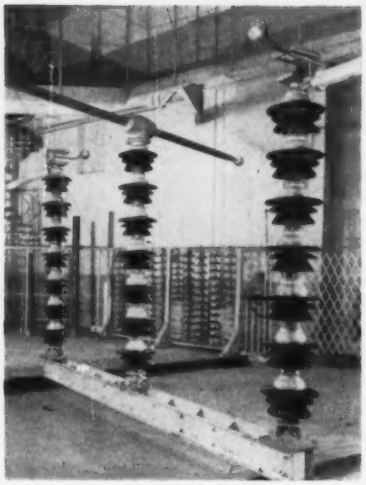
SHELL



Knowing that fittings are often re-used, Southern States has designed its entire line with easy, on-the-job assembly and re-assembly foremost in mind. Southern States connectors and bus supports have recessed hexagonal bolts, assuring easy and rapid "one-wrench" installation or removal. Each connector fits properly, has ample strength, and is sufficiently rugged at stress points. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



Double Side-Break Switch Developed for 345-Kv

Southern States Equipment Corp recently developed a 345-kv, 1,600-amp version of the company's type RDC double side-break air switch. It is shown here being subjected to visual corona, RIV, and dielectric tests at Southern States' laboratory in Hampton, Ga.

New A-C Pump Design Meets Salt Water Test

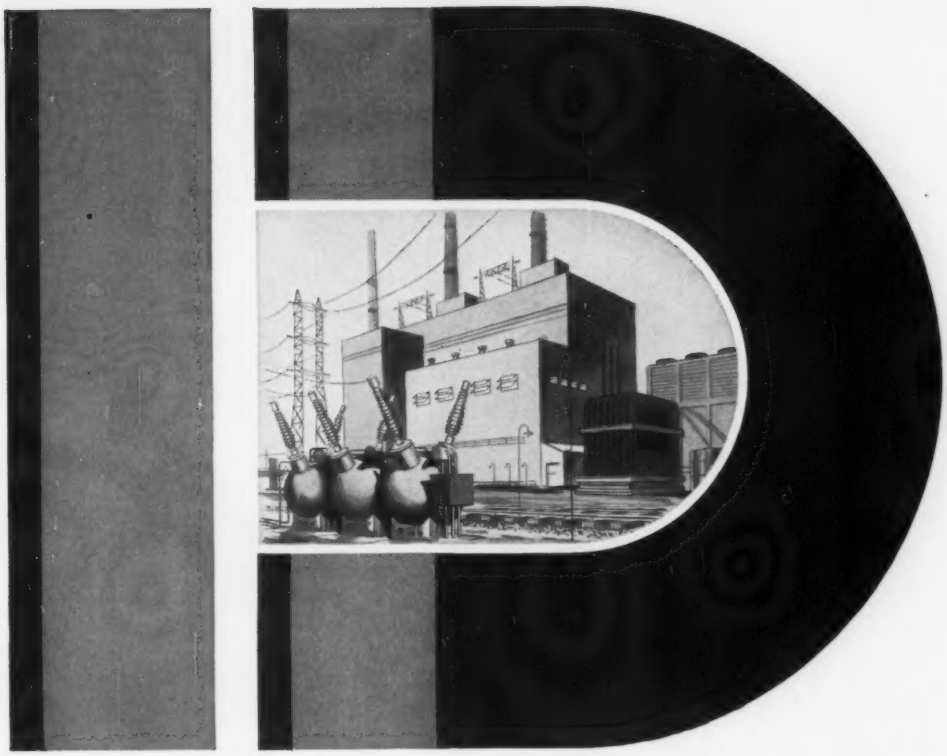
A new design of circulating water pump has been proved in two years of rough salt water service at Southern California Edison Co's El Segundo Plant. Allis-Chalmers Mfg Co reports that the pumps were found to be as good as new when pulled out of service for a routine check.

The pump columns are made of neoprene-coated fabricated carbon steel with stainless flanges. A-C reports that no signs of erosion, cracking or lifting were found in the neoprene coating.

Previously, A-C employed nickel cast iron columns for this service. The uncoated metal was more expensive and suffered deterioration from salt water service.

Allis-Chalmers considers the pumps a "step in the right direction" toward the cutting down of time out for station overhauls and in keeping with need for utilities to maintain load peaks during the summer.

(*More Manufacturing News, p* 90)



Little Gypsy - - - first computer controlled electric power plant!

The electric power industry took a giant step toward safer and more efficient plant operation with the announcement that the new 230,000 kw Little Gypsy Station of Louisiana Power & Light Company will be completely automatically controlled by a Daystrom digital computer control system.

The decision to go ahead with this project was backed by a year's operational experience with a Daystrom computer operating on-line at LP&L's Sterlington Steam Electric Station.

The original Sterlington installation, delivered over a year ago, came about through the combined engineering efforts of Louisiana Power & Light Company, Ebasco Services Inc., design and consulting engineers for LP&L, and Daystrom Systems.

The Sterlington computer system performance has demonstrated for the first time the reliability and utility essential to the stringent requirements of overall control responsibility. This field operating experience permits Daystrom to guarantee system operational availability of more than 99%. The uncompromising criterion of design which makes this performance possible dictates the complete elimination of vacuum tubes and moving parts.

The Little Gypsy computer system will perform the following functions: (1) Control sequentially the 800 or more steps necessary for plant start-up and shut-down, continuously checking the overall progress of the operation; (2) Monitor at the rate of ten times per second the hundreds of electrical signals signifying plant operating conditions and safety; (3) Instantly recognize abnormal conditions and take appropriate corrective action automatically; (4) Control combustion, feed water and steam temperature for best efficiency.

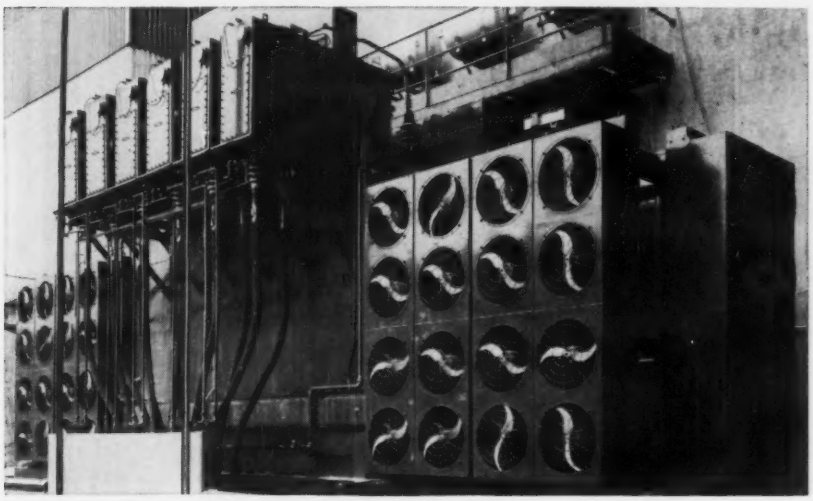
A substantial number of these systems have already been purchased for performance data reduction and automatic control. The availability of these new techniques and associated equipment warrant your careful study. For conference arrangements write or telephone Daystrom Systems, A-106, Miramar Road, La Jolla, California. GLencourt 4-0421.

INPUT CONSOLE—STERLINGTON COMPUTER.

DAYSTROM SYSTEMS
DIVISION OF DAYSTROM, INC.
Reliable computer control systems

Mr. S. Bennon, Manager, Westinghouse Large Power Transformer Engineering, and Mr. J. D. Goodwin, Large Power Transformer Sales, examine drawing of world's largest generator transformer, installed at Commonwealth Edison's Fisk Station.

Rated at 69 kv, 380 mva, FOA, this Westinghouse power transformer has two 69-kv windings, each rated at 210 mva, and one 17.2-kv winding rated at 380 mva.



WORLD'S HIGHEST INSTALLED CAPACITY

At 380 mva, the Westinghouse generator transformer at Commonwealth Edison's Fisk Station has the highest capacity of any such unit installed.

Here is another step upward toward the super kva banks of tomorrow . . . another step made possible by Westinghouse leadership in power transformer development.

Through the years, Westinghouse design engineers have developed improvements that permit building—and shipping—the higher capacity transformers required by higher and higher generation capacity. Here are some of these developments, and what they mean to the future of electric utilities:

"Form-Fit" construction—Highest mechanical and dielectric strength, to withstand all stresses of shipping, installation and service. Smaller, lighter transformers.

Forced-oil cooling—Increased cooling efficiency, greater capacity from a smaller transformer.

Inner-Cooled construction—Maximum utilization of materials used in conventional transformer construction reduces size and weight up to 15%, permits lower impedances and improved performance.

Insuldur* insulation system—Permits an extra 10% overload beyond your present loading practice with no additional loss of insulation life.

And here are other dollar-saving Bonus Values from Westinghouse Plowback of Earnings into research and development. Lower BIL's with savings in original cost, reduced losses, lower impedance and smaller size; vapor cooling, which combines the safety of dry-types with performance of liquid-immersed units.

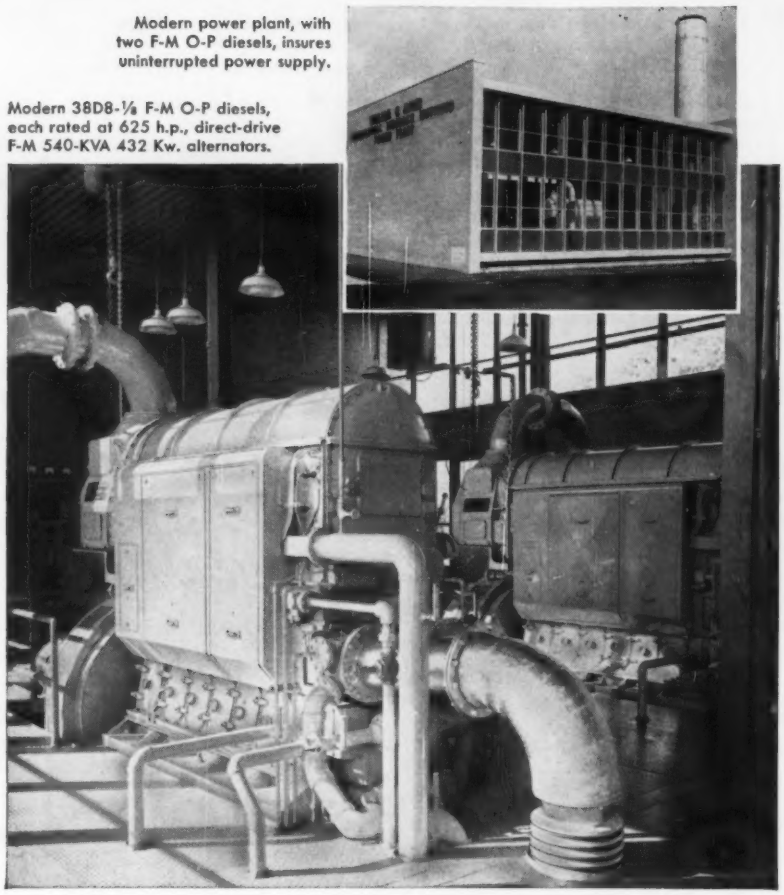
*Trade-Mark J-70877

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

Modern power plant, with two F-M O-P diesels, insures uninterrupted power supply.

Modern 38D8-⅛ F-M O-P diesels, each rated at 625 h.p., direct-drive F-M 540-KVA 432 Kw. alternators.



Miner installs power security!

In line with an increasing trend among institutions and industries, the new William H. Miner Agricultural Research Institute near Chazy, New York has installed a complete Fairbanks-Morse diesel-electric plant as positive protection against power failure.

The compact installation shown above features two Fairbanks-Morse Opposed-Piston diesels, direct-driving Fairbanks-Morse alternators.

The plant is completely self-sufficient. Should the area's hydro power supply fail, a 6-kw. Model 45 F-M diesel-generator set powers a motor-driven starting air compressor and pre-lube pumps to let the operator start one of the big F-M diesels in a hurry.

Find out why F-M two-cycle Opposed-Piston diesel power is unsurpassed for compactness, dependability and economy. Write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL, DUAL FUEL AND GAS ENGINES • LOCOMOTIVES • ELECTRIC MOTORS • GENERATORS
PUMPS • SCALES • COMPRESSORS • MAGNETOS • HOME WATER SYSTEMS

MANUFACTURERS BRIEFS

Keasbey & Mattison has formed a new products department to facilitate development of heat insulating products and others from the design to marketing stages . . . **Pittsburgh Standard Conduit** has replaced former headquarters in Etna, Pa., with a $2-million plant in Verona, Pa., which will increase productive capacity by more than 25%. Complete facilities are provided for making hot-dip galvanized and electro-galvanized electrical conduit in a full range of sizes from ½-in. through 6-in. diam, tubing from ½-in. through 2-in. diam, and a complete line of elbows, couplings, nipples, and other fittings . . . **Oliver Electrical Mfg** will add 150% more productive capacity by year's end, installing fabricating and materials-handling equipment and increasing galvanizing capacity 160%. The recent purchase of buildings adjacent to Battle Creek, Mich., plant more than doubled company's floor space . . . **I-T-E Circuit Breaker's** western regional headquarters have been transferred from Denver to San Francisco to serve 11 western states. A new $300,000 district headquarters has just been opened in South San Francisco . . . **Wolverine Tube** has established a new district sales office and mill depot in Norridge, Ill., to serve Chicago and the surrounding midwestern area . . . Meter box business of the **Binkley Mfg Co** was purchased by Clarence G. Duenke of The Clarken Co, as an independent company operating under the name of Durham-Duenke Co. Operations have been moved to Washington, Mo., from Warrenton, Mo. Roy F. Durham, the new president, headed the Utility Equipment Div of Binkley until '55.

The utility having the oldest GE dry-type, general-purpose transformer will receive in trade a new GE "quiet-high temperature" transformer of comparable rating, says **General Electric** in announcing a nationwide contest. Transformers eligible should be rated from 30 to 100 kva, single or three-phase or a bank of three single-phase units with a standard, general-purpose voltage rating of 600 v or below. They must have been in continual operation for at least 20 years up

to Feb. 1, '59. The contest closes Aug. 28. Entries may be made through any GE apparatus sales office or apparatus distributor . . . **Copperweld Steel Co's** Wire & Cable Div in Glassport, Pa., received an award from the Smithsonian Astophysical Observatory for support of the Moonwatch Project. A certificate of appreciation was given the company for technical advice provided the Satellite Optical Tracking Program, and for furnishing guy strand . . . At a recent **Ohio Brass** district meeting in Akron, Ohio, over 200 AIEE members, electrical manufacturers and consultants were shown high-voltage equipment in operation. J. H. Foote, chief engineer of Commonwealth Associates and AIEE presidential nominee, sat in a Faraday copper-screened cage with 285-kv current cracking over it and the stacking posts for one of the demonstrations . . . U.S. primary aluminum production rose to 155,213 short tons in April '59. This compared with 125.000 tons in April '58 and 157,189 last March.

A turning rig developed by **Allis-Chalmers** provides necessary clearance for rail shipments of steam turbine-generator stators, by permitting the stator to be rotated 90 deg. The stator is then lowered on its side on the shipping platform, affording greater clearance than if transported upright. A-C also says the rig cuts handling time and is safe for transit purposes. It was used recently to ship a 110-Mva, 330,000-lb generator stator to Gulf Power's Unit 4 of Crist steam plant, Pensacola. Adaptable to various stator sizes, the rig will be used next year to ship a 75-Mw steam turbine-generator for Crist's Unit 5 . . . **Reynolds Metals** has increased the guaranteed minimum conductivity of its hard-drawn 5005 aluminum cable from 52.14 to 53.5% IACS. The cable's conductivity originally correlated with 61% for EC grade wire. The improved percentage will correlate with 62.4% in EC . . . A new method of generating alphanumeric characters for electronic display purposes has been developed by **Philco** which can be adapted for high-speed computer readout functions. An entire system for generating 64 characters can be packaged in a single standard equipment rack, the manufacturer reports.

The CF&I Image assures quality

Galvanized Steel Strand

for Guy, Messenger & Ground Wires

The CF&I Image—giant symbol of dependable steel products—contributes to the ever-expanding industrial growth of America. And where telephone or utility lines spring up, you'll find the CF&I Image—for in the electrical and communications industries he stands for top-quality guy, messenger and ground wires.

To prevent pole leaning and power line sagging, use CF&I Galvanized Steel Strand. Made to customer specifications or to ASTM specifications A-122 or A-363, the steel strand is quality-controlled throughout every stage of production. That's why utilities rely on CF&I Galvanized Steel Strand to stand up under the most rugged conditions.

When you need strand, see your nearby CF&I representative or local distributor for complete details on CF&I Galvanized Steel Strand.

CF&I STEEL

GALVANIZED STEEL STRAND

THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings Boise • Butte • Denver • El Paso • Ft. Worth • Houston • Kansas City • Lincoln • Los Angeles Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco San Leandro • Seattle • Spokane • Wichita

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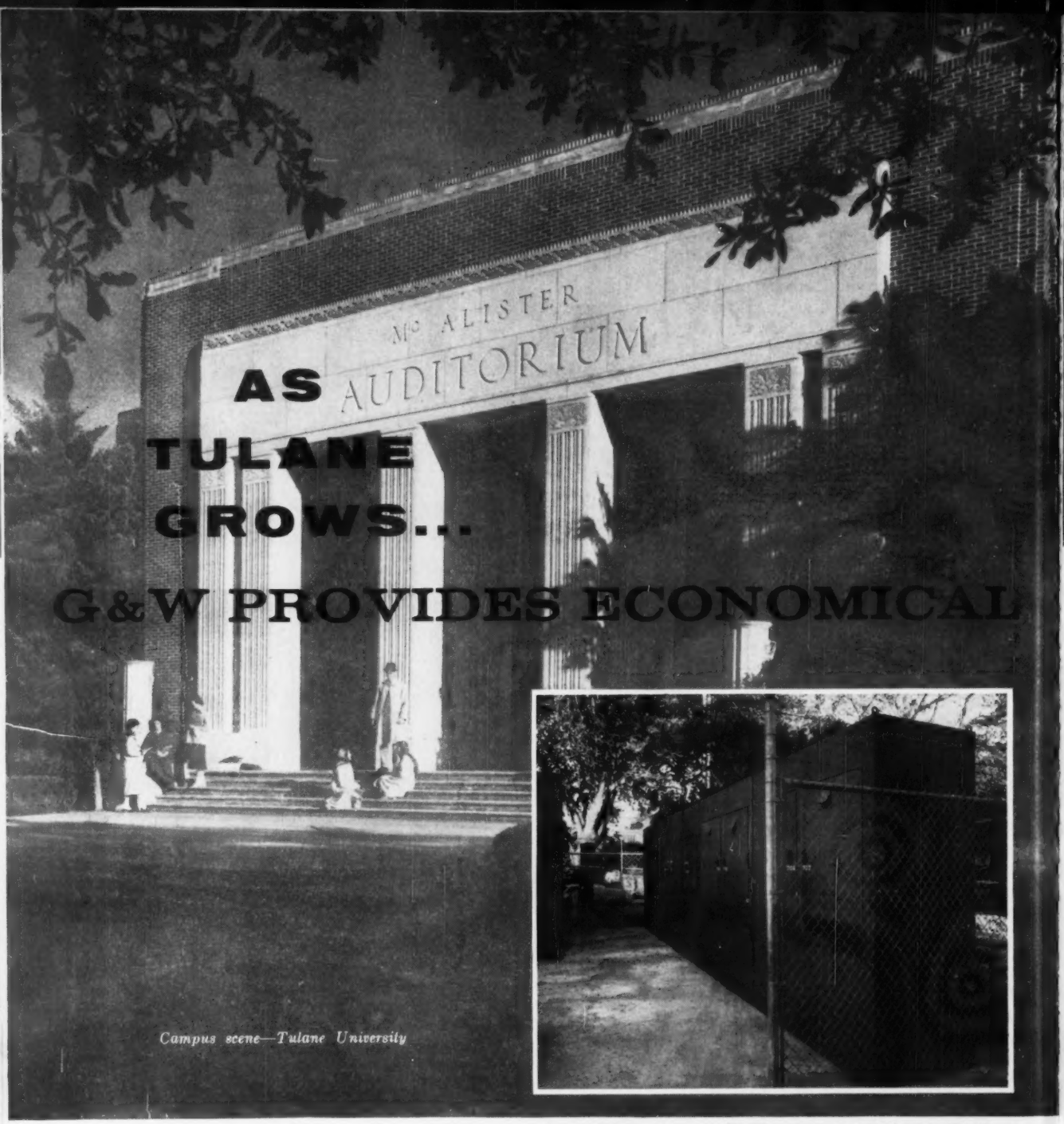
AS TULANE GROWS...

G&W PROVIDES ECONOMICAL



Campus scene—Tulane University

New main substation consists of two G&W Uniclad units. The large unit is the power center which houses a 15 kv, 400 ampere sectionalizing load break oil switch and eight three-phase power fuse taps. Facing it at left is the metering unit which houses a 15 kv, 400 ampere dual feeder load break oil switch and metering compartment.

Please send me your folder on the Tulane University installation.

Name_____

Position_____

Company_____

Address_____

City_____ Zone_____ State_____

FREE FOLDER tells how Tulane achieved flexibility and economy in its new electrical distribution system. Contains informative data for future reference.

SEND FOR IT TODAY!

Contributing to this project were G&W representative, W. P. Dillon; Director of Physical Plant Maintenance at Tulane, G. Johnson; consultants were W. King and R. C. Morgan IV of Design Engineers and Associates; I. Isaacson, Jr. of Weil and Moses; A. Pincus of Mario Zervigon and Associates and Joseph E. Leininger and Associates. The electrical contractors were Lindsey and Morgan, Gibson and Odom, Busy Electric, and Nola Electric.

G&W "RAL" sectionalizing switch installed in transformer vault. Loop feeders go to the switch to serve the load transformer. Feeders, switch, or load can be isolated without affecting the remainder of system. Shown are William King, design engineer (left), and George Johnson, Director of Physical Plant Maintenance, Tulane.

MEANS OF EXPANDING

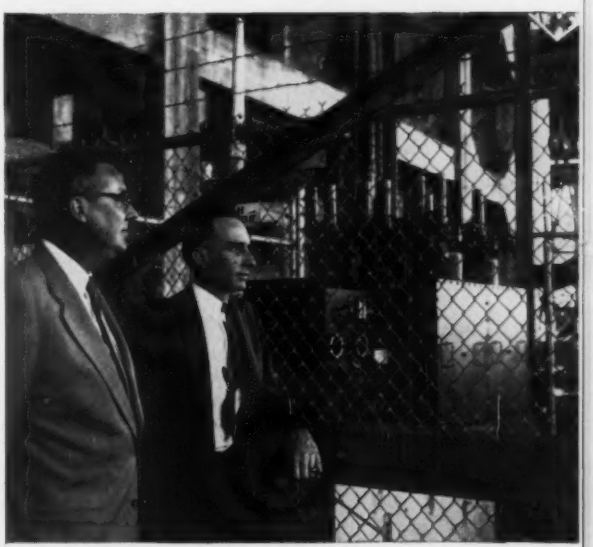
an underground distribution system

When Tulane University's rapid growth created a need for expanding the existing 2400 volt electrical distribution system to a 13,800 volt loop system, G&W equipment scored a new high for flexibility, economy and dependability.

Versatile G&W equipment provides a simple, comparatively low-cost means of isolating load and circuit faults in any part of the system to avoid excessive outages.

G&W switches, fuse cutouts and Uniclads (metalclad switchgear) offer worthwhile savings. Made of standardized components, they are engineered to meet the exact requirements of the job. Assembly is simplified. Result: unexcelled distribution system economy!

G&W equipment offers many other significant advantages. Our new Tulane University folder gives the full story . . . be sure to send for it today.



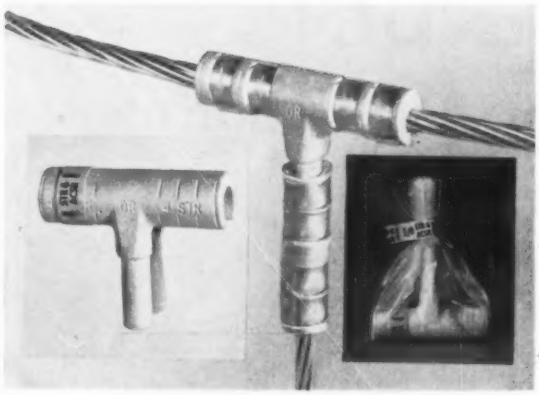
George Johnson of Tulane (left) and Alan Pincus, consulting engineer, check a G&W Load Break Oil Switch-Fuse Unit under the Tulane stadium.

G&W ELECTRIC SPECIALTY CO.
3500 W. 127th St., Blue Island, Ill.
Canadian Mfr.-Powerlite Devices, Ltd.
Toronto, Montreal & Vancouver

(For further information refer to Reader Service on page 96)

Magnetic Repeater . . .

. . . unit replaces six conventional isolating amplifiers in automatic control. The new economy feature in L&N steam temperature and combustion controls, for example, enables one transmitter to feed six control units for regulating fuel feed, dampers, valves, burner tilts, etc. A single signal to the unit produces six proportional outputs which are isolated and non-interacting.
Leeds & Northrup Co, 4934 Stenton Ave, Philadelphia 44, Pa.



Compression T-Taps . . .

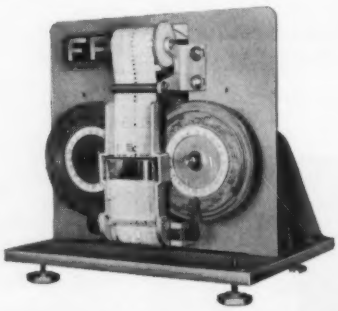
. . . can be applied with any compression tool that has a ⅝-in. groove. The sleevelike part of the connector traps the main line. Tap connection is made by joining tap line and stud of connector with 1/0 service-entrance compression sleeve. Four 1/0 Chance sleeves provide tap-line range from No. 10 stranded through 1/0 stranded. Main-line range is No. 6 ACSR, No. 6 stranded or No. 4 solid through No. 2 ACSR or No. 2 stranded.
A. B. Chance Co, Centralia, Mo.

Brushless Generator . . .

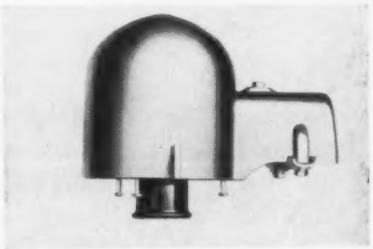
. . . designed to eliminate sparking is now available. Shorter and streamlined in appearance, the package unit has auxiliary equipment compactly mounted within the yoke enclosures. The design permits direct mounting of a switchboard on top of the unit. It is offered in 100, 125, 150 and 175-kw, 60-cycle 1,800-rpm units.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Recorder . . .

. . . lists analog values in binary-decimal punched tape form. The tape can be read directly, or translated automatically into standard punched cards or tape for computer processing. In addition, the Analog-to-Digital Recorder (ADR) simultaneously supplies the digital information in the form of electrical contacts that may be used for telemetering.



Fischer & Porter Co, 116 Jacksonville Rd, Hatboro, Pa.



Luminaire Head . . .

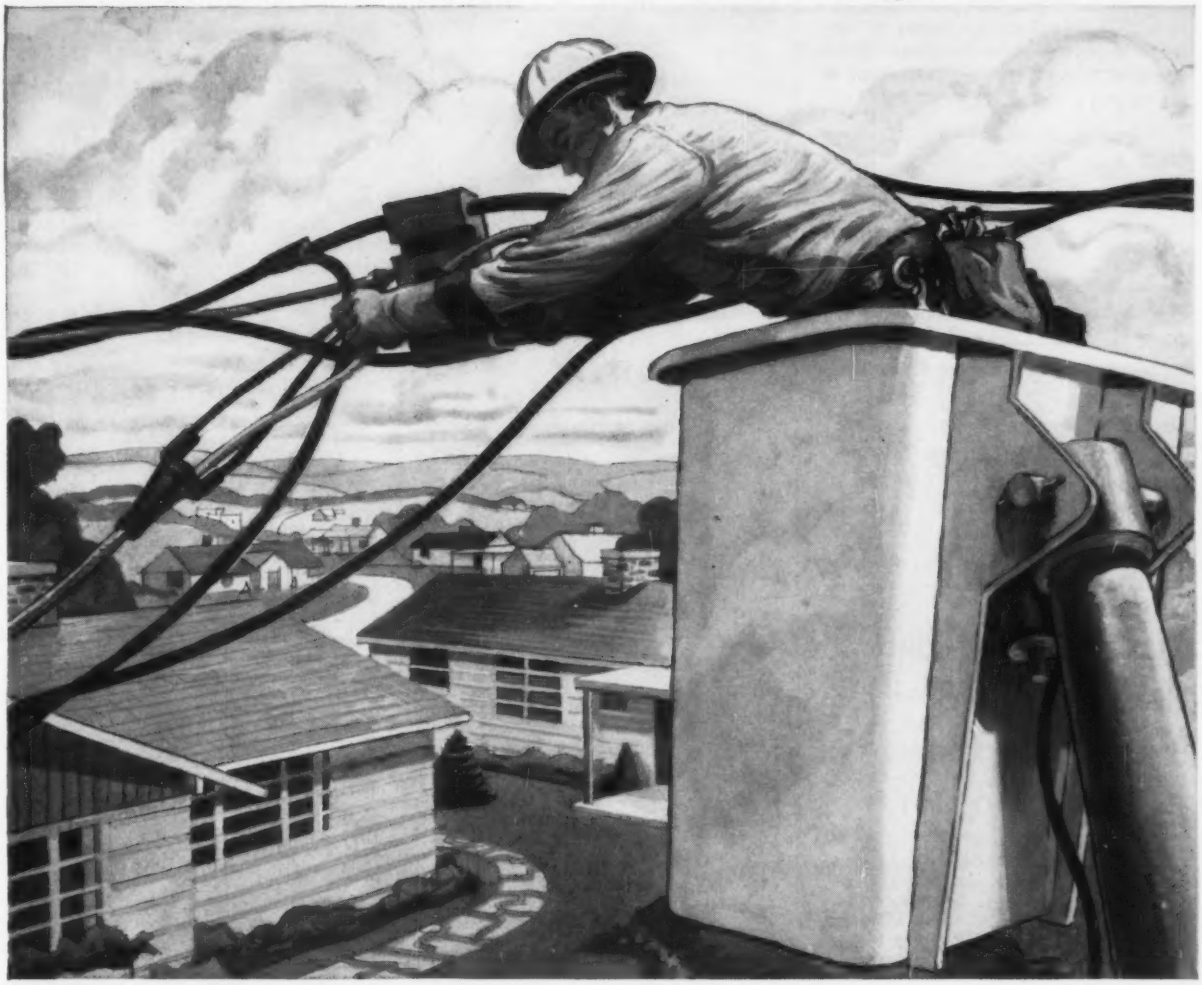
. . . is designed for use with optical assemblies that are mounted by three vertical screws. Features of the A14 head include a multiple mogul pull-out socket and an adjustable light center for 6 or 7-in. lamps. The head meets EEI-NEMA

(*Continued on page 96*)

TRIPLEX CABLE

cuts installation problems

...COSTS, TOO!



Triangle's Triplex Neutral-Supported Secondary Cable with the built in messenger offers the utility considerable advantages for semi-rural and housing development applications. Because it is self-supporting, longer spans can be used, requiring fewer poles. Crossarms are not needed. Midspan tapping permits direct runs from house to line, allowing by-passing of trees and other obstructions.

Triplex has a high resistance to wind and ice loading, and gives good protection against sunlight, heat, moisture, corrosive atmospheres and abrasion. It is available in several combinations of insulations and messengers.

Triplex Neutral-Supported Secondary Cable is just one of the new full line of Distribution and Service Cables described in the new Triangle Catalog. A request, on your letterhead please, will bring your copy to you.

Buy right—buy from your distributor

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Leeds & Northrup.....Repeater ☐
Chance .....T-Taps ☐
Allis-Chalmers .....Generator ☐
Fischer & Porter.....Recorder ☐
L–M .....Luminaire Head ☐
Woodhead.....Cable Reels ☐
Sorgel .....Transformers ☐
Texoma .....Augers ☐
Arizona Instrument.....Tester ☐
Columbia.....Tong Tester ☐
Automatic Nut.....Rib Bolt ☐

OTHER

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New York 36, N.Y.

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FOR:

Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

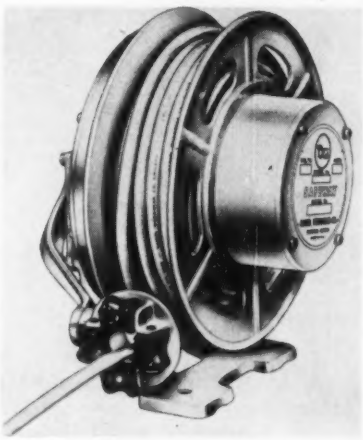
JUNE 8, 1959

Luminaire Head . . .

(*Continued from page* 94)

interchangeability and flashover standards, and its multiple voltage rating is 600 v.

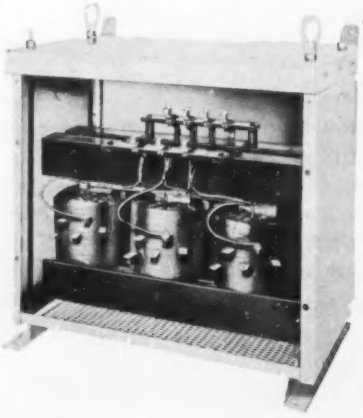
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.



Power Cable Reels . . .

. . . feature "add-on" collector rings that increase reel capacity to handle any number of conductors. The "Job-Rated" Safeway Reels are available in four basic diameters: 11½, 15, 20 and 24-in.—as well as in large size special reels.

Daniel Woodhead Co, Dept SR, 15 N Jefferson St, Chicago 6, Ill.



Dry-Type Transformer . . .

. . . in sizes up to 10,000 kva is now available. New design with self-supporting enclosures permits more

(*Continued on page* 97)

Adds years of service life to old poles

Treated wood poles as offered by the wood preserving industry are one of the best investments a utility can make. Protect this investment with a planned pole inspection program and ground-line treatment with Chapman Pol-Nu to replace normal preservative depletion.

POL-NU is a superior grease-type preservative containing a full 10% PENTAchlorophenol. Performance records indicate proper treatment should result in at least 15 years of additional pole life. Economy of treatment is achieved through use of the Pol-Nu Bandage-Maker, illustrated below.

Uniform, accurately measured coating of Pol-Nu is automatically applied to paper backing to form a pole bandage of required length as needed, in the field.

Preservative bandage is wrapped around the cleaned pole, may be applied immediately without waiting for wood to dry.

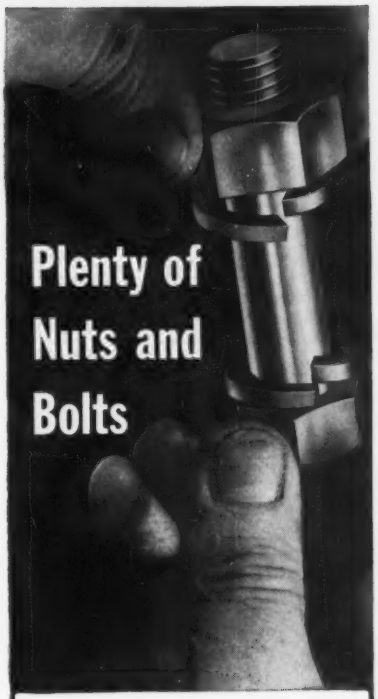
Write today for complete facts

CHAPMAN®

POL-NU

and Pol-Nu Bandage-Maker

CHAPMAN CHEMICAL COMPANY
Leading manufacturer of wood preservatives
P. O. BOX 138-B, MEMPHIS 1, TENN.
Palo Alto, Cal., Portland, Ore., Minneapolis, Charlotte, N.C.



. . . another reason for

Autocar's fine reputation

Nut and bolt assembly is far superior to the usual riveting and welding method in building a truck. It makes for more durable construction, lower maintenance and easier replacements in service. It is just one more quality characteristic that makes the Autocar "the world's finest".

Autocar
"World's Finest"

Division of
The White Motor Company
Exton, Pennsylvania

Dry-Type Transformer . . .

(*Continued from page* 96)

accessible entrance on sides, top, bottom or back. Connecting is done with solderless connectors on terminal blocks. Units up to 75 kva single-phase and 45 kva 3-phase are furnished for interchangeable wall or floor mounting.
Sorgel Electric Co, Milwaukee, Wis.

Earth Augers . . .

. . . **operate efficiently from any position** up to a 45-deg angle, from either side of a truck. The re-engineered line of Jaques Hydraulic Earth Augers has optional pole setting accessories that are readily attachable to the units. The units drill holes 9 to 72 in. diameter and up to 25 ft deep.
Texoma Enterprises, Sherman, Tex.

Combination Tester . . .

. . . **provides non-destructive Hi-Pot** and insulation testing. Fast acting

(*Continued on page* 98)

HOME WIRING MANUAL

Enables you to plan the "small distribution system" needed in the typical modern home electrical installation from beginning to end! Methods for determining loads, service entrance feeder size, number and size of branch circuits, number and type of outlets, etc—a new three-degree approach for simplifying the whole job of planning—quick reference tables—sample contract specifications—and much more are given. **By A. C. Bredahl, Westinghouse Electric Corp. 221 pp., 101 illus., $4.95.**

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Thorough, practical guide to economic and technical factors involved in electric utility rate making. Gives fundamentals of electric utility business; discusses price structure, tariff, cost analyses, rate department, earnings, utility plant, depreciation, rate of return, etc. **By R. E. Caywood, Manager of Rates, West Penn Power Co. 248 pp., 45 illus., $10.00.**

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Enables electricians to understand and do work in accordance with the 1956 National Electrical Code. In this handbook you will find explanations of rules and measurements for the various types of jobs—what they mean—how to apply them. Diagrams, sketches, and illustrations used throughout. **By A. L. Abbott. 9th Ed. revised by C. L. Smith, Elect. Field Engr., Nat. Fire Protect. Assn. 642 pp., 394 illus., $8.00.**

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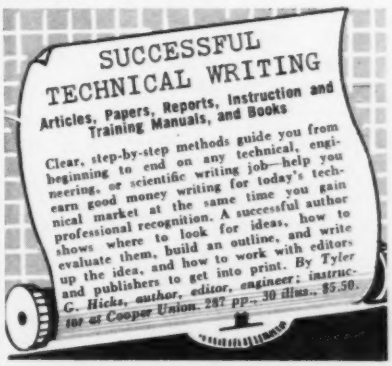
JUST OUT!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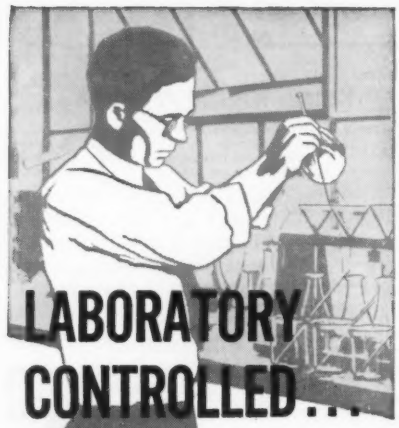

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GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

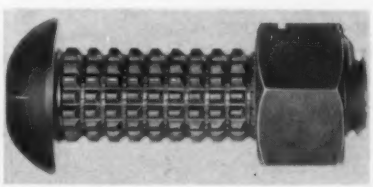
Combination Tester . . .

(*Continued from page* 97)

protective electronic circuit allows repetitive tests without instrument or product damage. Voltage range on standard units is 0-3,500 v dc and 0-2,500 v ac at 60 cycles.
Arizona Instrument Corp, 2342 E Broadway, Phoenix, Ariz.

Tong Tester . . .

. . . measures dc in ½-amp divisions from 0 to 10 amp. The Type PB Tong Test Ammeter also reads both ac and dc up to 20 amp. Jaws can accommodate conductors up to ½ in. diameter.
Columbia Electric Mfg Co, 4519 Hamilton Ave, Cleveland 14, Ohio.



Structural Rib Bolt . . .

. . . for tower construction does not require a washer and does not have to be torqued. The relatively hard ribs and the taper at the start of the ribs permit easy driving. Ribs burnish grooves in the holes of structural members but do not peel off while being driven in the holes.
Automatic Nut Co, Lebanon, Pa.

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KOPPERS COMPANY, INC.
Pittsburgh 19, Pennsylvania

ANOTHER GENERAL ELECTRIC *Kilovar Plus...*

STAINLESS-STEEL Capacitors by General Electric Eliminate Repainting, Cut Maintenance Costs

W. G. HART, *Manager—Power Capacitor Sales, points out G-E capacitor corrosion-resistant feature.*

GENERAL ELECTRIC STAINLESS-STEEL CASE POWER CAPACITORS eliminate leaks caused by corrosion or rust, keeping bothersome inspections and costly maintenance to a minimum. You can use G-E capacitors to supply kilovars anywhere, regardless of atmospheric conditions. They are not affected by corrosive salt-water spray found along coast lines and resist chemical agents in industrial areas.

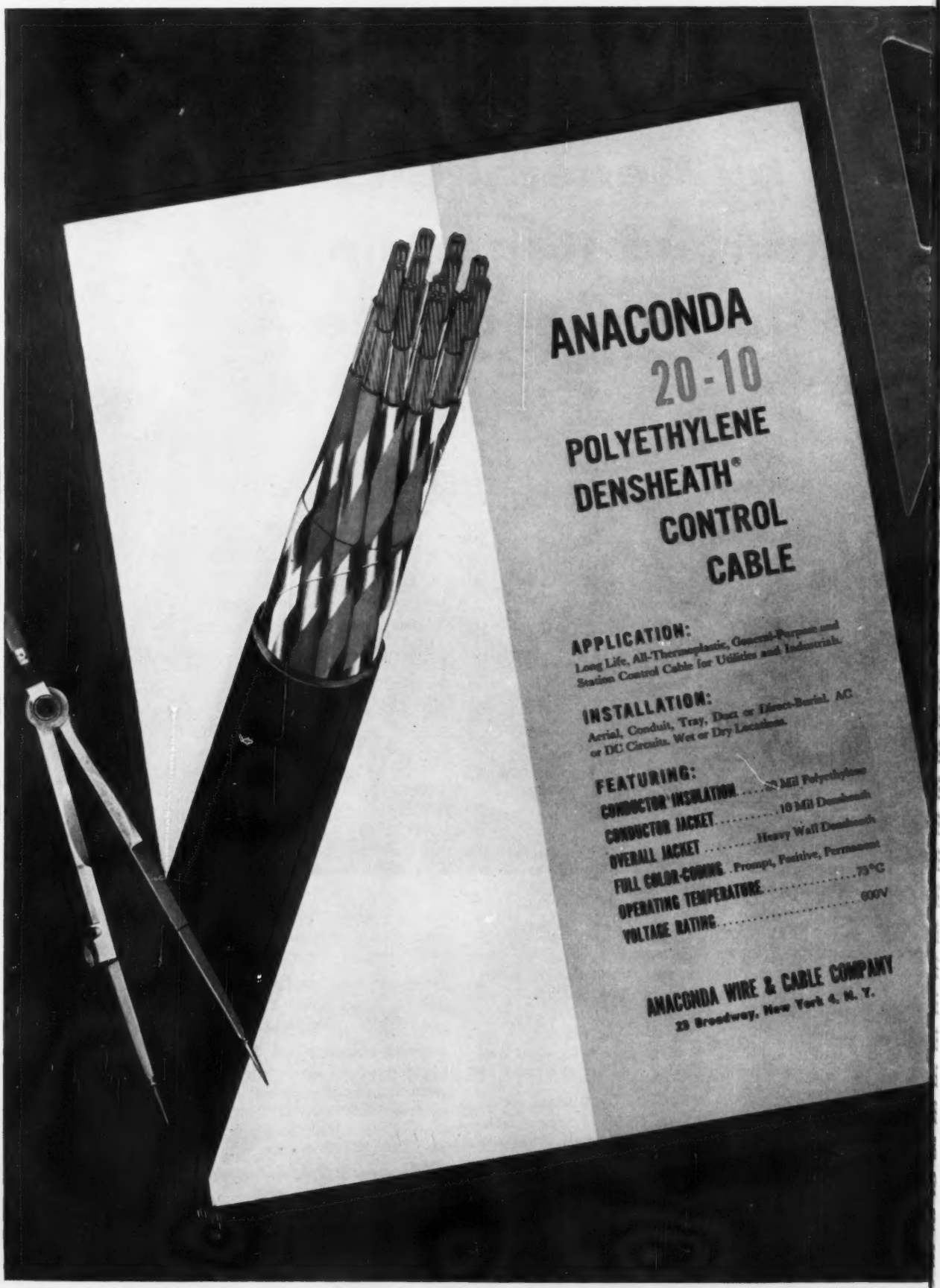
NO PAINT MAINTENANCE IS REQUIRED, either. This means substantial savings for you. For example, many utility engineers estimate that capacitors with ordinary case material have to be taken off the pole or out of racks for repainting at least once or twice during their service life, at a cost of $8 to $10 per repainting. Because G-E stainless-steel capacitor cases require no protective repainting, you get a direct savings in system maintenance.

THE STAINLESS-STEEL CASE is a standard feature of all G-E 25 and 50-kvar power capacitors and 3, 5, and 7.5-kvar residential secondary capacitors.

SEE FOR YOURSELF how General Electric's stainless-steel capacitors can help you cut maintenance costs. Contact your nearest General Electric Apparatus Sales Office, or write to Section 445–25, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC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CONDUCTOR JACKET 10 Mil Denzheath
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ANACONDA OFFERS ONE CONTROL CABLE FOR PRACTICALLY ALL 600-VOLT APPLICATIONS: ANACONDA THERMOPLASTIC 20-10 CONTROL CABLE!

Polyethylene—Densheath* (PVC) construction provides superior features, makes possible new economies and improved service through standardization.

Anaconda—after testing a wide range of designs — recommends 20-10 Control Cable as today's superior all-purpose thermoplastic cable for 600-volt service. Here is a standard control cable for practically every 600-volt application —one that simplifies your ordering, stocking, installing, makes possible new economies in time and money.

Anaconda 20-10 Control Cable has been designed to meet all the exacting requirements for the highest quality control cable. Each conductor is insulated with 20 mils of polyethylene, then covered with 10 mils of Densheath (PVC). This construction combines the full IPCEA recommended insulation thickness (30 mils for 600 volts) with the flame retardance, excellent color coding and abrasion-resistance of PVC.

This composite design results in a control cable that can be used in virtually all 600-volt control applications. It can be installed aerially, in conduits, trays or ducts, and directly buried.

For 1000-volt rating, this same design is recommended, with the thickness of Polyethylene and Densheath (PVC) increased to 30 and 15 mils respectively.

Write for descriptive bulletin DM-5844 for complete technical details on Anaconda 20-10 Control Cable. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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ANACONDA®

FOR 20-10 CONTROL CABLE

ANACONDA WIRE & CABLE COMPANY EWD
25 Broadway, New York 4, New York

Gentlemen:

Please send me a copy of Bulletin DM-5844 containing full technical information on Anaconda 20-10 Thermoplastic Control Cable.

Name.....

Company.....

Address.....

City.....Zone....State.....

Washington EEI Meeting Stresses Transmission (*Continuing from page 57*)

with highway authorities were listed by Richard H. Taylor, Detroit Edison Co, as the key problems facing utility right-of-way men. Early acquisition of future right-of-way, Taylor said, will assure availability when needed; protect against restrictions or zoning; assure orderly construction, effect savings, and, improve customer relations. Finally, in urging better liaison and goodwill between highways and utilities Taylor suggested the formation of a utility industry committee to coordinate liaison on a national scale.

Carry Cables On Bridge

Addition by Consolidated Edison Co of 1½ million kva in three new substations supplying 69-kv subtransmission facilities in New York City was detailed by T. C. Duncan. Key to the new facilities is a new Queensbridge substation that taps 138-kv inter-station ties and steps power down to 69-kv to supply six gas-filled feeder cables carried over the Queensboro Bridge to link with new 69-kv substations at E. 63rd and W. 65th streets, Manhattan.

Steps in the installation of a 36-kv aluminum-sheath, gas-filled aerial cable to link a suburban substation with a subtransmission loop on the Rochester Gas & Electric Co system were shown in a film presented by H. A. Brown. The 9,000-ft cable has a capacity of 25,000 kva, and threads a heavily treed area on a pole line already carrying 4,160-v primaries, telephone cable, and street light circuits. Use of an aluminum sheath and gas-filled construction reduced paper insulation and contributed to a 45% reduction in weight under conventional cable.

Request for an extension of underground and network transformer standards to include network units in the 34.5-kv class is leading the EEI-NEMA Subcommittee to seek elimination of the dual standard described in Parts A and B of the network transformer specifications. J. A. Pulsford, Public Service Electric & Gas Co, who is subcommittee chairman, urged utilities' planning to use 34.5-kv network supply voltage to consider the economies of a 2 over a 3-position short-circuiting-and-grounding switch. Standardization on a 2-position switch would permit elimination of Part A from present standards.

Rising equipment and installation costs, mounting load densities, increasing subtransmission and distribution voltage and the unavailability of substation sites and rights-of-way were cited by a 4-man panel among factors influencing the location, capacity, and arrangement of distribution substations. Panelists were: E. A. Fisher, Union Electric Co; H. L. Sangster, Potomac Electric Co; A. B. Weaver, Central Power & Light Co; and, C. E. Baugh, Pacific Gas & Electric Co.

Panel Studies Substation Layout

Weaver said lack of pole space and pole-line right-of-way is leading his company to study the economics of overhead primary cable and may force resort to underground duct and cable. Baugh cited use of a digit computer for analyzing economic distribution patterns and planning future subtransmission and primary distribution configurations. Fisher said that in some St. Louis residential substations it was necessary to depress above-ground equipment below grade, to fence, to landscape, and even to enclose equipment in a building shell in order to obtain building permits. Sangster said about 2/3 of the PEPCO system is primary network, a factor contributing to ease of analysis. Essentials of arrangement of primary supply lines can be presented graphically—particularly voltage and thermal capability limitations.

Factors considered by Philadelphia Electric Co engineers in studying the possibilities of an aerial-to-underground changeover of distribution facilities were reported by R. A. Market and R. N. Rau. The study showed that complete change-over was neither feasible nor desirable and involved prohibitive costs.

Partial changeover, involving only polyphase portions of the primary distribution circuits, was found more desirable as it would rid the system of a source of communicating faults and bring substantial visual improvement.

Stormproofing or reinforcing of the aerial system is expected to eliminate a high percentage of distribution outages caused by weather.

Size of shopping center loads, the number and size of conductors to serve them, and appearance made underground supply systems an economic necessity for shopping centers on the PEPCO system, Clinton G. Light said. The practice is well justified by revenue received, he said, but has created many small underground systems, both radial or low-voltage network, scattered throughout the suburbs.

With 4 kv inadequate for such loads, 13.2 and 33 kv are used to supply the bigger shopping centers. Because 33 kv is finding application as distribution voltage, there is no economic choice except this voltage in some cases, he observed.

Underground Mechanization Told

Savings approaching $60,000 a year are realized by Cleveland Electric Illuminating Co with an improved cable pulling and reeling equipment patterned after wire tensioning equipment used in transmission construction. The unit has the ability to raise and lower a 4-ton reel of cable, turn a reel at 1 to 20 rpm, provide a breakaway pull of 15,000 lb, and handle reel sizes up to 72 by 60 in. Use of the unit, R. E. Kroffke said, can cut manhours for installing a 1,000 ft of cable by 38%. On cable removal it has cut manhours per 1,000 ft of cable by 59%.

C. B. Bechtel described a mechanized cable scrapping machine used on the Baltimore Gas & Electric Co system to pull out, cut, and bundle scrap cable in the field. The trailer unit is capable of developing 7,000-lb tension and pulling cable at 20 to 30 ft per min.

Use of double-ratio transformers by Cleveland Electric Illuminating not only simplified conversion from 4,800-v undergrounded-wye to 7.62/13.2-kv multigrounded-wye distribution but also produced a direct initial saving of $15 per transformer. Taking into account future use of original dual-ratio units for other conversion operations, H. C. Bingham estimated that the present worth of future savings, excluding overheads, would be $78 per transformer converted.

Public Relations

What To Do When Storm Strikes

Storms bring out the best—or the worst—in a utility's PR program. When customers are out of service, the only truly effective piece of public relations is to get them back in again as quickly as possible. But there's a lot the public relations department can do to hold down the bad effects of an outage until the line crews have done their work. Here is a round-up of tips on emergency PR that were presented at last fall's PIP Workshop Conference. Now, as much of the U. S. girds for storm season, is a good time to see if any of them can help you.

The most important rule is: Tell the truth. Don't try to cover up. Alfred I. Zipprian of Baltimore Gas & Electric Co spoke for all the companies stretching up and down the East Coast hurricane belt when he emphasized: "Don't underestimate the job to be done. If anything, add a little lead time to the final restoration date . . . If the situation is very severe, say so!"

Establish immediate liaison with newspapers, wire services, radio, and TV. Work out a schedule of reporting which best fits their needs. Know what deadlines have to be met. Know that morning papers need material for their earliest edition. Know that radio stations want something for the earliest news broadcast—and this may mean calls between 5:00 and 6:00 a. m. Some utilities invite reporters to the company offices and set them up with desks and telephones. Some provide the news media with private telephone lines to be sure that they will not be shut off from the company by "busy" signals at deadline time.

"Let reporters come behind the scenes," Zipprian urged. "If it sounds radical, remember that it pays dividends." Aside from the favorable publicity it may bring, when the paper has its own man in the utility's headquarters, "he will know that you are feeding him all the news that is available, and you won't have to spend precious time on the telephone rehashing old material or parrying questions."

The customers must have direct answers to their questions, too. And that means keeping employees, local authorities informed. Atlantic City Electric Co has made good use of a device known as "Grapevine 277"—a recorded telephone message on service restoration and other important storm news which employees can hear by dialing "277." Some of the Florida companies work closely with the Red Cross, thereby spreading the word to customers without clogging company

Ten Tips on Storm Public Relations

Before It Happens . . .

1. Have a flexible plan for emergency public relations. Some utilities hold periodic "dry runs" to insure efficiency.
2. Prepare for problems likely to arise after the storm. One company has a booklet explaining why mass undergrounding is impractical.
3. Tell customers what to do as the storm approaches. Many companies use the press, radio, TV to advise customers to stock up on canned goods, draw water, etc.

When It Strikes . . .

4. Begin public relations work as soon as possible. Operate around the clock if necessary.
5. Tell the truth. Don't try to cover up. Don't underestimate the job; if anything, add a little lead time to final restoration date.
6. Get accurate information to newsmen—fast. Know their deadlines. Some utilities give them private phone lines or set them up with office space at the storm PR headquarters.
7. Keep employees and local authorities informed. They'll keep customers posted. Work closely with police, fire departments, Red Cross.
8. Pull promotional ads during emergency. (Don't plug 'Housepower' while lines are down).
9. Be a good neighbor. Several companies give free dry ice to customers whose power is off. If line crews from other areas come in to help, treat them well.

After It's Over . . .

10. Take notice of the inconvenience caused by the outage. Some companies use ads, radio-TV spots, or bill inserts thanking affected customers for their patience. Others use regular ad spots for messages on rehabilitating damaged trees, resetting thermostats, etc.

switchboards. Florida Power & Light Co stations 50 non-engineering personnel at strategic locations to maintain direct contact with the public.

Many utilities use radio and TV spots to give customers advance warning of approaching storms and to tell them what to do before they strike. These messages urge the public to stock up on canned goods, draw water, cook foods that are likely to spoil, etc. Connecticut Light & Power Co has published a pamphlet on "What To Do If Your Freezer Stops."

Several companies distribute free dry ice during outages. Florida P&L arranges rush shipments of dry ice to neighborhood electric refrigerator dealers and tells customers where they can pick it up. Baltimore Gas & Electric buys up all the dry ice it can get as soon as it is apparent that a long outage is inevitable, sometimes having it shipped in from outside the state. The ice is cut into blocks and trucked to predetermined points throughout Baltimore to be distributed. The company spreads the word through all media. A sheet of instructions on proper use of dry ice goes with each block. Persons getting the ice are asked to sign their names, but no charge is made.

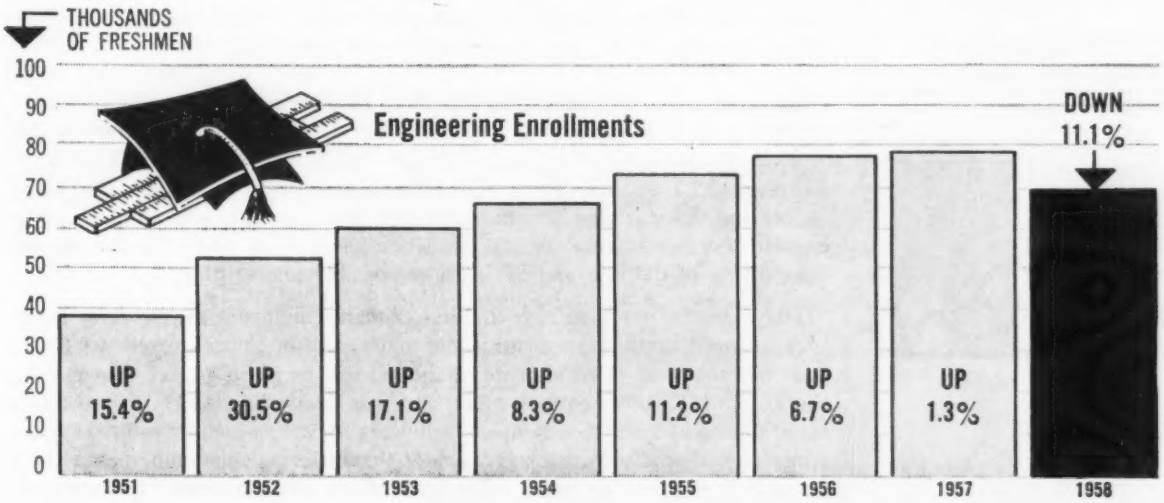
Some other hints that have paid off: Don't forget to pull promotional advertising during an emergency ("It is embarrassing to see a 'Housepower' ad cheek by jowl with an emergency message about no service at all.") If merchandise ads, or radio—TV spots are blithely bragging about your services, pull them. Use the time for emergency announcements. At least one company advocates no shut-offs for non-pay during serious emergencies, and some consideration has been given to postponement of meter reading in the affected areas.

One company follows this rule in giving information to the press: "When news is bad, never quote an individual—use 'a spokesman.' When news is good, quote by name." Another company passes on this tip: Relieve operators who handle customer calls every two hours, "to reduce the possibility of sharp answers by overly-tired employees." And Long Island Lighting Co, noting the public clamor

to put everything underground that usually follows a hurricane, has prepared in advance with a booklet, "Out of Sight, Out of Mind," explaining the practical objections to undertaking this multi-million-dollar project.

After the storm is over, there is some difference of opinion about what to do. Some utilities believe strongly in "Thank you" ads, some in a factual notice that outlines the problem and tells what was done about it. Others believe that what's done is done and should be forgotten. For several weeks after a serious storm, one company used its regular radio spots for messages on rehabilitation of damaged trees and shrubbery, resetting of clock thermostats on furnaces, etc.

These hints can help reduce a utility's storm PR problems, but they are not enough by themselves. As Zipprian put it: "Emergencies bring into sharp focus whether or not a utility has successfully built up over the years public acceptance of its earnest desire to do its best in fair weather or disaster. Without a strong bedrock of public approval, all the publicity gimmicks are so much lost effort."



Freshmen Give Engineering the 'Cold Shoulder'

Engineering Manpower

Engineering enrollments declined last fall for the first time in eight years. And, oddly enough, the decline came at a time of rising job opportunities, record starting salaries for young engineers, and greater challenges to the engineering profession than ever before.

The decline was sharpest among college freshmen. Each year in the period between 1950 and 1957, freshman engineering enrollment in the U. S. had increased over the preceeding year, climbing from 34,299 in 1950 to 78,757 in 1957. Last year, however, the trend line snapped. Only 70,029 freshmen enrolled in engineering courses—a drop of 11.1% to a total below the 1955 level of enrollments.

Why the decline? The Engineering Manpower Commission of the Engineers Joint Council went after the answer early this year. In cooperation with the American Society for Engineering Education, the commission polled college deans of engineering. Responses from 150 deans point to these reasons:

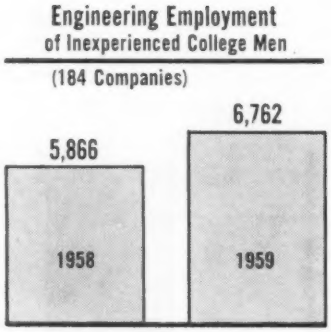
• **Reports of diminishing job opportunities in engineering.** During the recession, layoffs of engineers in various industries were played up in the newspapers. In the opinions of most deans, these reports exerted considerable influence on high

school seniors and their parents in the choice of college studies. The erroneous interpretation was that engineering opportunities were drying up.

• **Increased concern about the rigors of an engineering curriculum.** The deans believe that the desire to avoid hard courses has steered some freshmen away from engineering. And the commission adds that some counselors reinforce this fear by exaggerating the difficulty of engineering courses.

• **More interest in other scientific fields.** Most deans have the impression that science enrollments are rising, although there's insufficient evidence that this increase accounted for much of the decline in engineering enrollments.

Biggest part of the problem is motivation and counseling, according to 75% of the deans. One put it down to: ". . . unfavorable publicity on the availability of jobs for engineering students during 1957. We felt the effects," he continued, "of announcements such as 'mass layoff of engineers;' however, we were able to combat this to some degree locally through counter publicity. Job offers to engineering graduates at this university averaged about four apiece during 1957 as compared to nine job offers each the preceding year. The average salary accepted was $500 a month. It seems appalling that if five engineers are 'laid off' in Philadelphia, the news makes nationwide headlines."



More emphasis on the challenging aspects of engineering might serve to motivate students with real engineering potential, the commission noted. One of the deans explained the decline in enrollments this way: "Previous to Sputnik, it was accepted that engineering was somewhat more difficult than the other majors, but this was no deterrent to the high school student with an engineering interest. Further, technology was such that the student could picture himself doing many of the jobs and having a responsible role to play.

"Today's youth, living an easy life, has drummed into him the need for many years of hard study prerequisite to an engineering or science career which he finds will not result in an ultimate salary that will be much greater than that he can expect from other careers which aren't as demanding. He further pictures himself being assigned to a complex technical project in which he can have but a minor part. Faced with prospects such as these, the capable young person may possibly be selecting an easier career in which he can play a role of more personal responsibility, however limited."

Many of the deans felt that science had stolen some of engineering's glamor. One summed it up: "The daily prints refer to the impact of science on our civilization—rarely do they mention science *and engineering*. We must point out that it is engineering which is making most of our rapid scientific progress possible—that a moon rocket is a triumph of engineering; the knowledge gained by the rocket's instruments is science."

What about this year? The deans don't expect much change. About 45% of them look for 1959 fall freshman enrollments in engineering to increase. Another 20% look for further declines; and 34% either are unable to estimate or anticipate no change. There's little doubt that enrollments will pick up eventually, however. Demand for engineers still seems to be on the upswing, despite the headlines mentioned by the deans. According to one survey (by Frank S. Endicott, Director of Placement at Northwestern University) of 184 business and industrial concerns, these firms plan to hire 15% more young engineers in 1959 than in 1958. For electrical engineers only, the indicated increase is 80%.

Not all the deans consider the dip in enrollments as necessarily a bad sign. One said: "We are concerned over the trend in 1958-59, but consider it temporary, and believe for the most part this drop includes applicants who should not have registered for engineering. In support of this view is the fact of lesser attrition thus far this year than has been our experience in the last few years."

Illinois Tech Host to Relay Group

Topics include fault current study developments, switching multi-terminal lines and automatic reclosing schemes

Fault current studies were facilitated on the Northern States Power Co system through a new analyzer, Ruben Zimmering, NSP relay engineer, told the Illinois Institute of Technology's relay conference which was held, April 30-May 1 in Chicago. Metering on the analyzer is by a digital-type voltmeter. The fixed portion of the analyzer is set up to represent the existing NSP system, yet any element of the fixed portion can be opened or replaced easily by a variable unit of proposed system change.

The analyzer, said Zimmering, has provisions for 120 generators, 572 buses and 1,568 fixed units, yet it is only 43 by 106 by 67½ in. high. All generators of the system can be switched as a unit. The analyzer is constantly available to relay engineers.

Trip Five at Once

How to trip five circuit breakers simultaneously, was the theme developed by T. E. Dy Liacco, Cleveland Electric Illuminating Co. Dy Liacco told how the application of microwave relaying solved the problem of switching multi-terminal transmission lines and postponed expensive system changes. The scheme made use of a unique permissive overreaching type relay, fault detectors being set to overreach the farthest terminal. The system gives high-speed fault clearing and good system stability.

Seventeen variations of automatic reclosing schemes to fit numerous transmission line arrangements were presented by L. C. La Tourette, Pioneer Service & Engineering Co. The arrangements make use of standard relay parts. Developed for unattended substations, these relaying schemes have proved so successful that they are being installed on breakers in attended stations as well. These arrangements greatly reduced the rebuilding of switchboard panels, as they are easily revised to meet changing patterns of transmission and distribution systems.

Changing the angle of compensation on the relay results in up to 10% improvement in the relay's ability to override the tendency to trip on a leading power factor load on a power transformer, said G. S. Ridge, Consumers Power Co, in presenting a paper prepared jointly with B. R. Klett, Commonwealth Associates Inc. The problem has arisen, he said, as a result of the growing use of static capacitors. The leading power factor load can come about because of feeder tripping, transformer disconnection, or normal load dropping.

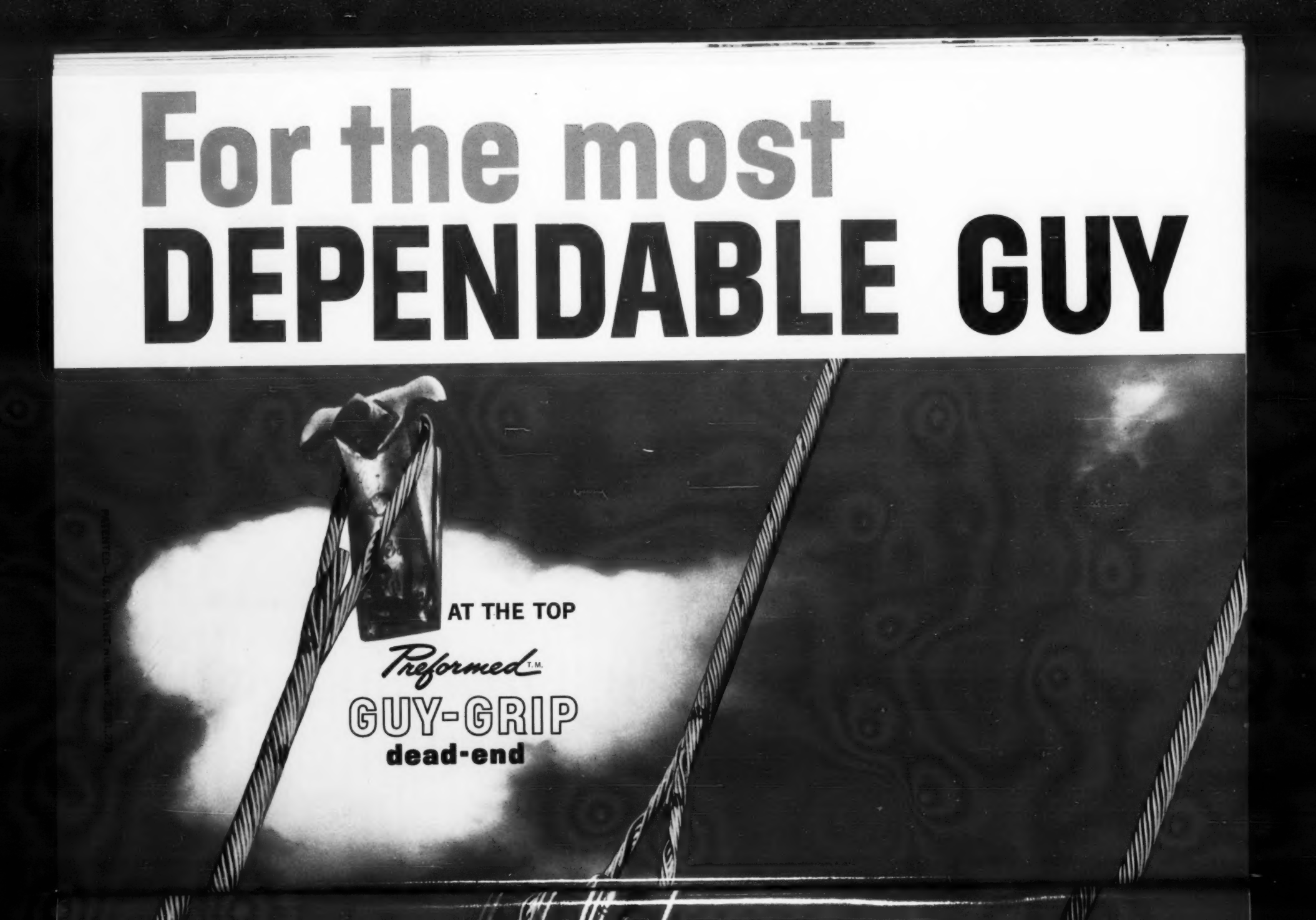
With the angle changed on the relay, said Ridge, the current setting tap for the most part cannot be raised because it is necessary for the relay to operate for minimum short-circuit conditions.

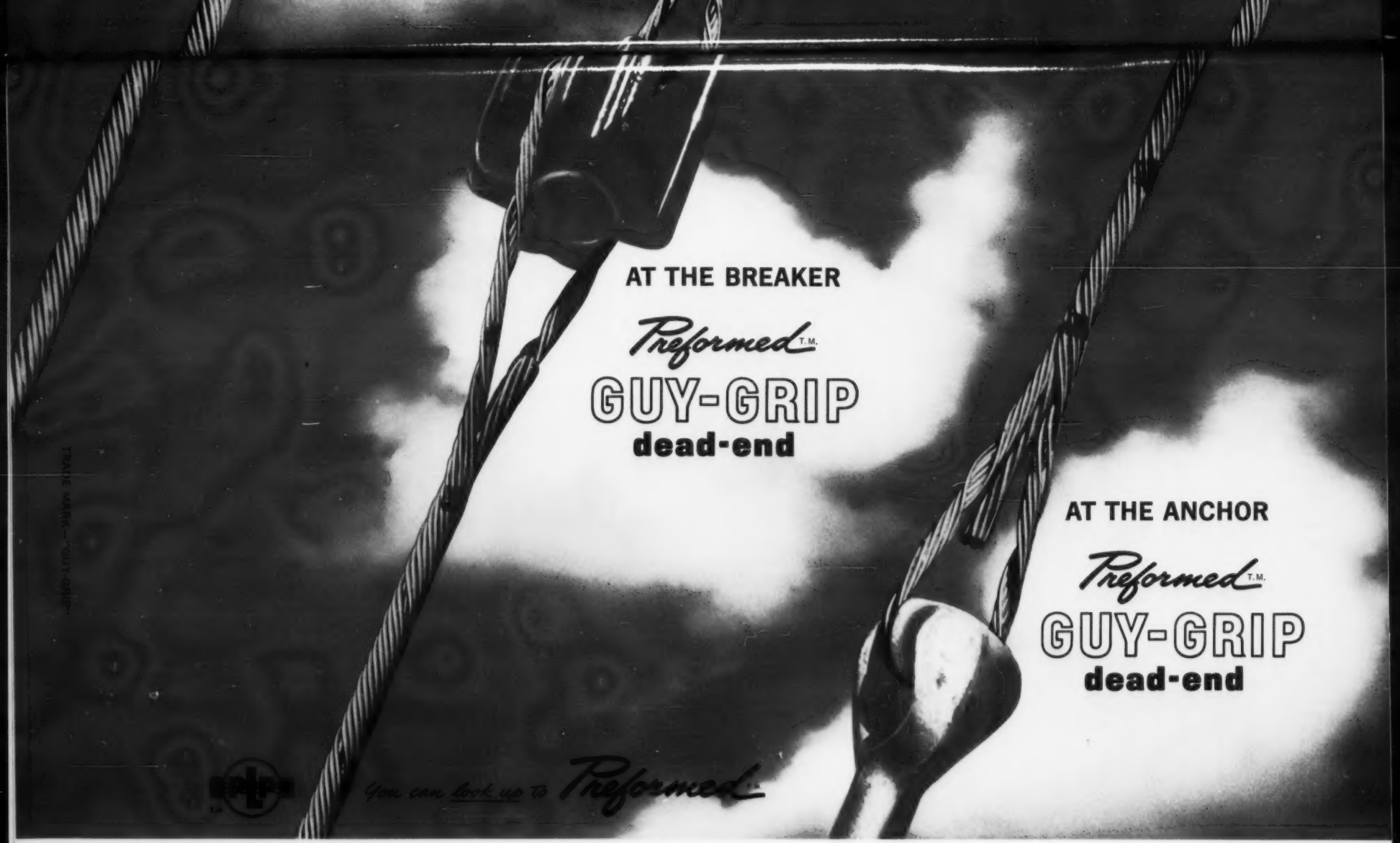
K-dar relays, a family of polyphase compensator-type, distance relays having unique characteristics, were described by H. J. Calhoun, Westinghouse Electric Corp. The impedance circles change automatically to provide extra coverage for variable arc resistance values. The polyphase system of the relay uses energy from the unfaulted phase to provide a high degree of sensitivity. Accuracy of reach is fixed by precision-built compensators, making field adjustments unnecessary. Sensitivity of the polyphase-compensator system is sufficient for short line applications.

Low-cost protection is available for bus or transformer faults in substations through use of automatic grounding switches that trip breakers at the line source, said Stanley A. Olson, Commonwealth Edison Co. He described installations on the CE Co 138-kv system and said the grounding switch eliminates the need for breakers at these substations. On that system there is no stability problem, said Olson, as there are plenty of lines and they are relatively short. So far the grounding switch installation has been limited to substations where transformer capacity is 20,000 kva.

G. S. RIDGE, Consumer Power Co, explains solution to relay problem arising from wider use of static capacitors. L. C. LaTourette, Pioneer Service & Engineering Co, center, and Ruben Zimmering, Northern States Power Co, at left listen

For the most DEPENDABLE GUY





Write for the Preformed
Booklet-of-the-Month
"THE GOOD GUY"

PREFORMED LINE PRODUCTS CO.
DEPT. GG 2
5349 St. Clair Avenue · Cleveland 3, Ohio

Wires Longhand Trouble Calls

Florida P&L customer service department relays data to crew dispatchers by two-way telescribing communications

WOODROW E. WILSON, Distribution Supervisor, Florida Power & Light Co, Miami, Fla.

Direct wire longhand transmission brings information from customers, given by telephone, to Florida Power & Light Co dispatchers who order trouble trucks to trouble spots by radio. This graphic link between two sonic methods of communication has been found to be accurate, efficient, and controllable.

Response to a trouble call begins with reception of a customer's telephoned message in the pivotal customer service department, where 32 clerks man phones on a three-shift basis. A clerk enters the information on a service request form with space for trouble descriptions.

He then moves a few steps to a TelAutograph transceiver, on which he writes the information with a pen-like stylus just as he would any longhand message. As he writes, the message is received in the dispatch center a mile and a half away. The message comes in exactly as written, even to the dotting of the "i's." Two forms are written automatically. That filled out in the service department remains as visual proof that the information was received and retransmitted. The second form is written automatically in the dispatching office.

FORM coming out of the sending transceiver is kept as positive proof that data were transmitted to dispatch center. Preprinted boxes ensure completeness

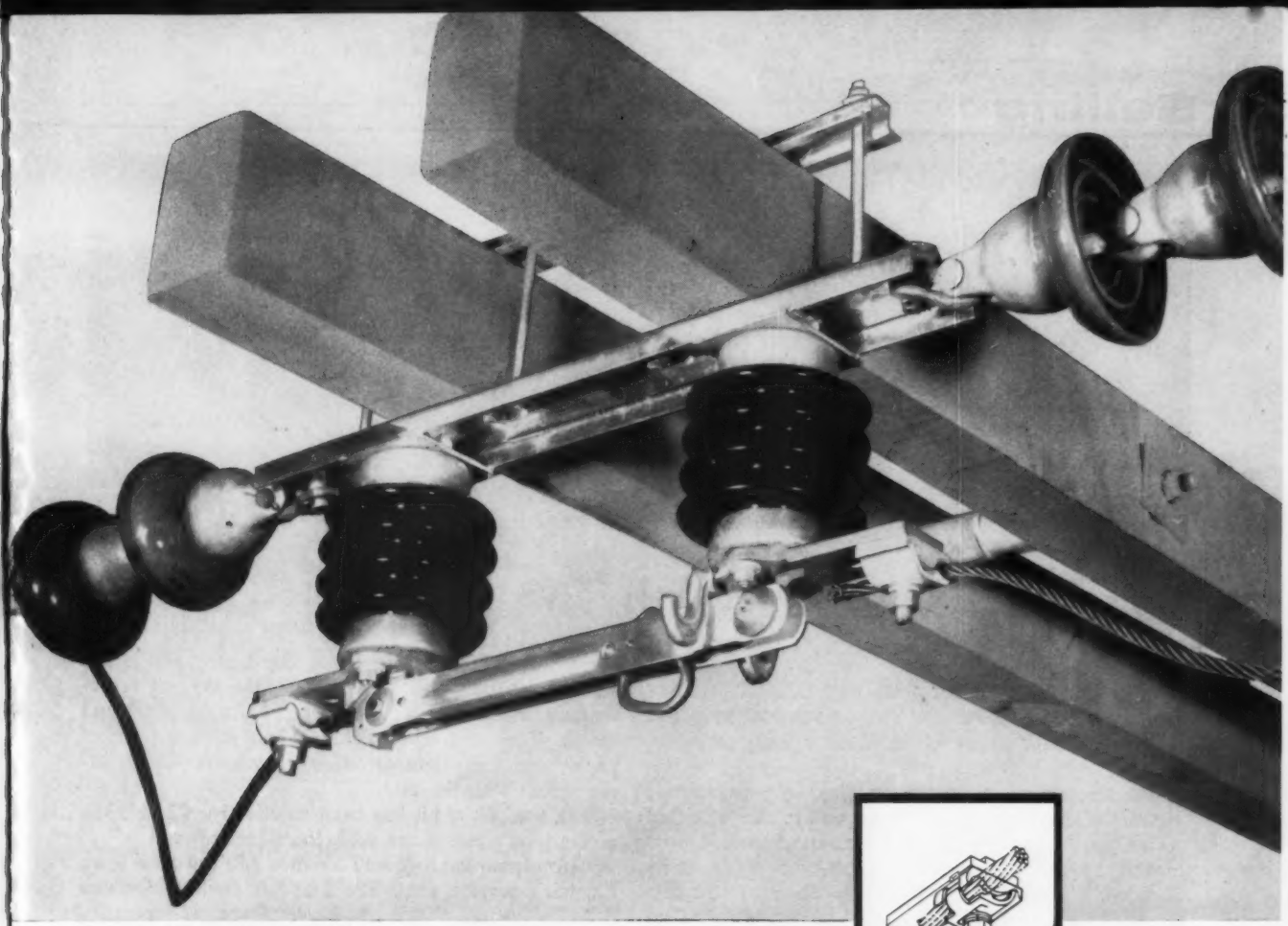
Before the introduction of this equipment, the heavy flow of messages between customer service and the trouble section was handled by telephone. This involved several difficulties. Intense phone traffic created confusion in the trouble section, especially in an emergency produced by a sudden storm. Error was probable in transmitting large amounts of data by phone, and there was much duplication. Furthermore, there was no tangible evidence that calls had been received or retransmitted.

These shortcomings have been eliminated. Today, there is just one transcribing step in the system, the writing of the data on the transceiver. When no one is present at the receiving unit in the dispatch center, the message is nevertheless accurately recorded. Even 100 consecutive calls, coming one on top of another during a severe weather disturbance, can be recorded, transmitted, and received without difficulty. Each is on a separate form that moves automatically out of the machine to make place for the next one.

Forms from the machine are deposited in slots beside the dispatchers' work section. Dispatchers can pinpoint the trouble and the power lines involved on the wall or detailed section maps. Knowing the whereabouts of the trouble trucks, they can move skilled repairmen to the trouble scene in the shortest possible time. A buzzer on the transceiver alerts dispatchers.

When trouble requires special crews, the data recorded on the back of the form allow dispatchers to send the right men with the right equipment. The dispatch center receiver can also send all-clear messages back to the service center. Once trouble has been corrected, the form in the dispatch center represents a detailed record of the trouble call, the time of receipt and dispatching, the repairmen involved, and the action taken. These slips are collated with the troubleman's field report, and both are logged in a master log.

The system works without jam-up or backlogging, and has proved its efficiency and economy.



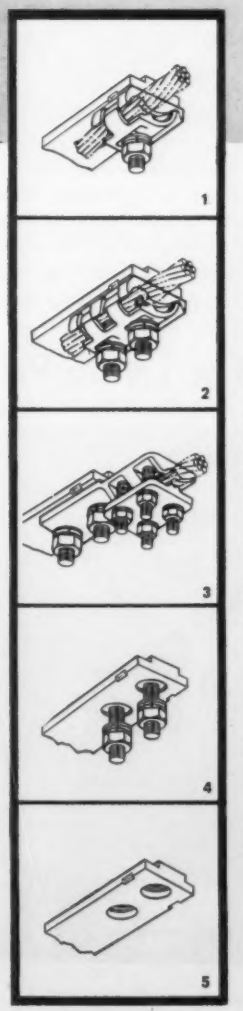
S&C LOADBUSTER DISCONNECT rated 400 amps continuous, 15 kv, 95 kv BIL. For use with LOADBUSTER® S&C's portable loadbreak tool

Now with S&C LOADBUSTER DISCONNECTS you have widest choice of connectors

No matter what your connector preference, you can satisfy it with S&C's LOADBUSTER DISCONNECTS. Here's why: You can get a choice of two new styles of groove-type connectors (details at right) and three NEMA Standard pad terminal connectors. Not enough?

You can also have the LOADBUSTER DISCONNECT with aluminum or bronze captive bolts—an S&C first—for hot-line tool installation of compression connectors. Or, if you prefer, you can obtain this disconnect without any connectors or connector hardware.

For more details please write for Bulletin 721. S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill.



1. NEW Bronze groove-type connector. Single bolt, captive for hot-line tool handling. Takes No. 2 solid through 500 Mcm stranded copper.

2. NEW Aluminum alloy groove-type connector. Zinc-tin plated, two bolt, captive for hot-line tool handling. Takes No. 2 solid copper through 500 Mcm stranded copper or aluminum.

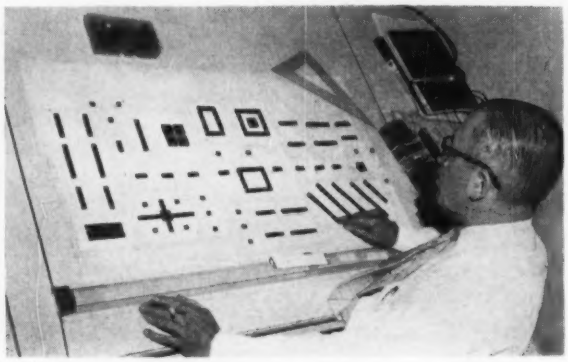
3. NEMA standard pad terminal connectors for copper conductor. Three sizes: No. 6 solid through 2/0 stranded; 2/0 solid through 4/0 stranded; and 250 Mcm through 500 Mcm.

4. NEW Aluminum or bronze captive bolts. Will take your choice of connectors—compression or other types.

5. NEW. Any connector can be used with this terminal pad. It has standard NEMA drilling—two 9/16" holes on 1¾" centers.

S&C ELECTRIC COMPANY

From outline plan of lighting area . . .



to final lighting plan . . .

Takes 20 Minutes With The Lite-Kit

A Lite-Kit which makes it easier for lighting salesmen to plan and visualize different lighting arrangements for a customer has been developed by Dean Barnhizer, manager of commercial lighting at Iowa Electric Light & Power Co.

The kit is a plastic box containing 18 plastic forms of various standard light fixtures, sized to the scale that is used in drawing lighting layouts. The figures can be moved around on the floor plan and plans easily changed. They offer an unusual presentation to the customer, and Barnhizer has found customers like to shuffle the pieces around to fit their own ideas of a desired lighting arrangement. When a customer does this he is on the way to being sold, Barnhizer reports.

The lighting or sales engineer normally is required to use thin sketch paper to predetermine layout designs for a given area. This is often time consuming and is not always pictorial. With the Lite-Kit, the lighting representative can call on a customer, measure the width and length of the area to be lighted, draw it on a piece of paper, and then demonstrate an attractive design arrangement with the kit.

The use of the kit has been so effective 92 to 93% of the jobs planned are sold, Barnhizer says.

A four-man lighting staff handles 350 towns in Iowa Electric's service area. The Lite-Kit greatly increases the effectiveness of this small sales force, he reports.

The Lite-Kit contains miniatures of the following standard lighting fixtures: 4 ft by 4 ft fixtures; two or four-tube fixtures, 4 ft, 8 ft and 12 ft long; 12 ft by 12 ft square fixtures for surface mounting or recessed lighting; and round units.

Light For Living Prize Winners Receive Cash Awards

Checks for $2,000 each have been awarded to the four regional first prize winners in the Light For Living Medallion Home Competition for student architects. It is part of Edison Electric Institute's National Electric Living Program.

In the photo left, John Bulcken III, a freshman in the Pennsylvania State University School of Architecture, receives his prize from Theodore O. McQuiston, vice president, Metropolitan Edison Co. Other first prize winners were: P. Connor Lee, Hamilton, N. C.; William C. McGee, Jr., Raleigh, N. C.; and James F. Kluttz, Raleigh, N. C.

Sixteen student architects received honorable mention awards of $500 each. Additional prizes equal to 25% of each award went to the students' schools.

The entries were judged on the basis of the best practical residential lighting design, and the best architectural house design for a particular region.

Architectural plans of the prize winning houses, based on student designs, will be distributed to electric utilities who will make them available to builders.

Housing Development Gets Fluorescent Street Lights

What is believed to be the first fluorescent street lighting installation for a housing development has been installed on the lines of the Dayton Power & Light Co.

Ninety-three General Electric fluorescent luminaires have been put up in Kettering, O., on the streets of a 750-unit, duplex apartment, development. Fifteen of the fixtures are two-lamp, six-ft units, while the remainder are two-lamp, two-ft luminaries.

"The street lighting has done wonders for the area. Not only is it a good selling point—particularly for families with small children—but it also encourages night apartment-hunting," says J. R. Cashen, vice president of the Huber Management Corp, owners of the development.

Medallion Joins Select Group at Portugal Museum

The Medallion, symbol of the Bronze and Gold Medallion Homes, has joined a collection of rare coins and medals in Portugal.

A letter from the director of the museum in Figueira De Foz, Portugal to the General Electric Co said that they would like to put the Medallion alongside "other coins and medals, foreign and national, either civil, military, commercial or religious," that are in the museum's Medal Cabinet.

The request was granted.

Small Homes Heat Pump Developed by Carrier

A compact, one-piece residential heat pump which will provide complete winter and summer air conditioning for smaller homes and multi-unit dwellings has been developed by Carrier Corp.

The new heat pump has a cooling capacity of 22,000 Btu and a heating output of 23,000 Btu, with additional strip heaters available at 10,000 Btu each.

Hotpoint Launches Appliance Tour

Hotpoint Co launched the national tour of its Custom Trend experimental appliances at Indianapolis, Ind., May 12. The appliances were first introduced at the Appliance Show in Chicago in January and then were shown at the Builders Show.

Indianapolis Power & Light Co cooperated in the initial tour showing and displayed Custom Trend appliances at strategic points on its sales floor to stimulate traffic and general public interest in appliances.

In the photo, William Barkhau, Indianapolis Power & Light Co, (right) shows the electronic oven to Leonard Jury, representative for a commercial food service establishment.

Other stops scheduled for the Custom Trend appliances include: Indiana & Michigan Electric Co offices at South Bend, Fort Wayne, and Marion, Ind.; and Detroit Edison Co. Tentative plans include stops at Philadelphia Electric Co and Consolidated Edison Co.

There are five units in the Custom Trend Line. Only one of each has been built so far.

They include:

- A counter top oven with four fold-up surface units. A feature is availability of counter space when surface units are not in use.
- Barbecue center with a recessed barbecue pit and 6,000-w calrod unit.
- Swedish modern range set on a walnut wood base of modernistic furniture design.
- Cooking center consisting of a conventional oven, an electronic oven and four surface units that slide in and out.
- Refreshment center.

Penelec Names Two Vp's

Two vice presidents have been named by Pennsylvania Electric Co. Russell A. Shumaker has been elected vice president in charge of Eastern Operations, and Morris M. Devorris, vice president, Western Operations. Frank W. Womer Jr., succeeds Devorris as manager of the Eastern Division, and David J. Bechtold succeeds Womer as manager of the Central Division.

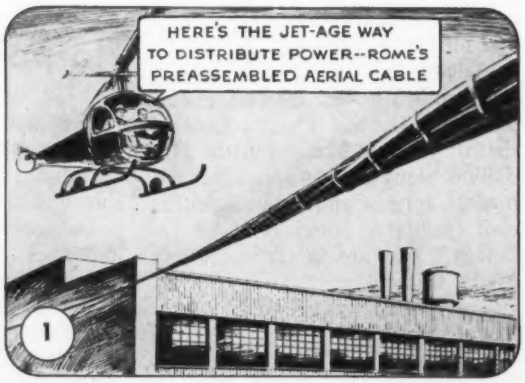
SHUMAKER

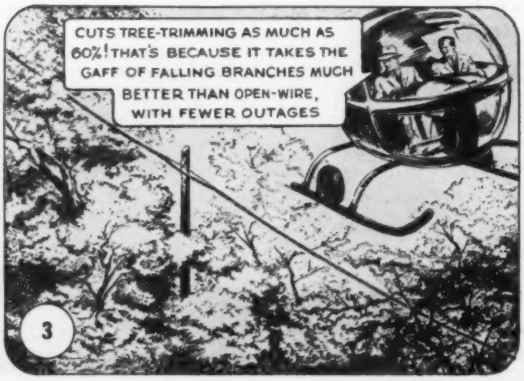
Shumaker started his utility career in 1922 in the construction department. From 1929 to 1951, he was district engineer, general foreman, and district manager in Indiana, Pa. In 1951 he moved to Johnstown as district manager, and the following year was made Southern Division operating superintendent. He went to Clearfield in 1955 to reorganize and manage the Central Division. Then he served as president of Brockway Light, Heat & Power Co until it was merged with Penelec last year.

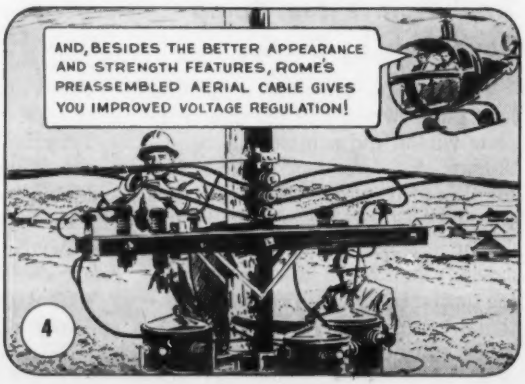
Devorris started his career with the former Penn Central Light & Power Co as a radio engineer in 1930. He held various positions in the engineering department until 1946 when he became industrial sales engineer for Penelec's Eastern Division. He was promoted division manager in September last year.

DEVORRIS

WHAT'S UP IN AERIAL POWER?




CUTS TREE-TRIMMING AS MUCH AS 60%! THAT'S BECAUSE IT TAKES THE GAFF OF FALLING BRANCHES MUCH BETTER THAN OPEN-WIRE, WITH FEWER OUTAGES
3


AND, BESIDES THE BETTER APPEARANCE AND STRENGTH FEATURES, ROME'S PREASSEMBLED AERIAL CABLE GIVES YOU IMPROVED VOLTAGE REGULATION!
4

Con Ed's Holmberg Feted

Edward A. Holmberg, advertising manager of Consolidated Edison Co of New York, recently celebrated 50 years with the company.

His first utility job was in 1909 at the age of 14 when he took a summer job with Brooklyn Edison Co, as office boy for advertising. He soon transferred to sales but returned to advertising eight years ago.

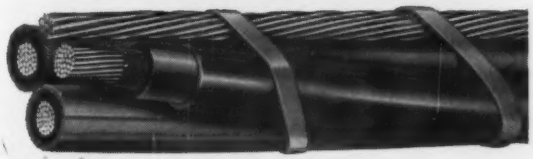
In the photo, Holmberg, left, receives his 50th service anniversary pin from Harland C. Forbes, chairman of the board of Con Ed.

Atkinson Promoted to Vice President

Harold W. Atkinson has been promoted to vice president of Cambridge, Electric Light Co, a subsidiary of New England Gas & Electric Assn.

He joined the company in 1935 and was assigned to power sales and engineering. In 1949, he was appointed assistant to the general manager, and, in 1957, general manager.

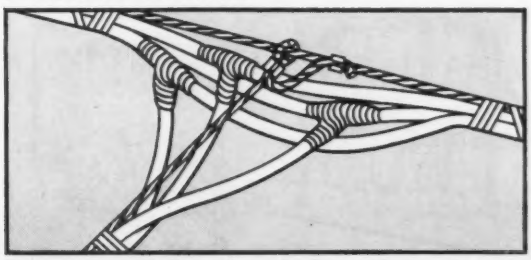
He is a director of the NEGEA Service Corp and the Electric Institute, Inc.



For service to 15 kv You get your choice of two premium ozone-resistant insulations when you specify Rome's aerial cable: Rozone (oil-base) or Rozone A (butyl-base). Rome is one of the few suppliers offering you this important latitude in cable selection. For complete information, contact your nearest Rome Cable salesman.

ROME CABLE

A matter of FACT



You can tap anywhere along the line with Rome's preassembled aerial cable. Lay of the conductors is reversed every five feet to provide slack for easiest tapping even when line is hot.

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WHO'S DEDICATED TO YOUR JOB
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Rome, New York

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Name.....
Title.....
Company.....
Street.....
City.....Zone.....State.....

Kansas City P&L Ups Metzger to Vp

METZGER

Kansas City Power & Light Co has made four organizational changes. Philip L. Metzger has been elected a vice president. Herbert A. Heim has been made manager of an expanded operating department. C. Myron Lytle has been named staff assistant to the executive vice president, and William D. Webb has become assistant secretary.

Metzger joined the utility in 1951 as supervisor of employment. He is a native of Chicago and holds two degrees from the University of Chicago.

Heim was superintendent of transmission and distribution. Lytle has been with the company for 38 years and was formerly manager of system operations.

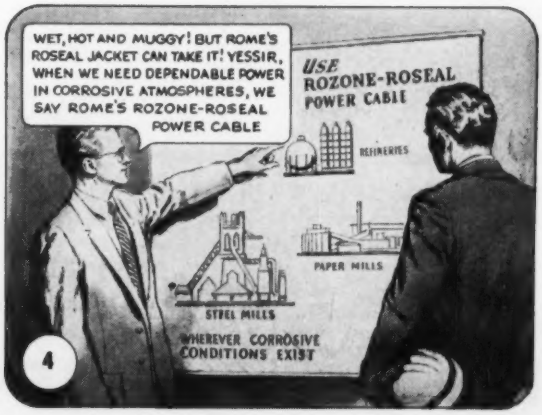
HEIM

Parry Becomes Manufacturing Vp

Samuel R. Parry, formerly vice president and general manager of the Chattanooga Division of Combustion Engineering, Inc, has been appointed vice president in charge of manufacturing. Harry J. Bolwell has been named general manager of the Chattanooga Division.

Parry joined the company in 1923. He has held the positions of chief engineer, production manager, general superintendent, and assistant general manager of the company's division at Chattanooga. Bolwell was formerly assistant general manager at Chattanooga.

IN CORROSIVE AREAS, WE USE ROZONE-ROSEAL POWER CABLE. THAT ROSEAL JACKET IS TOPS AGAINST OIL, CORROSIVE FUMES, AND MOST CHEMICALS
1


WET, HOT AND MUGGY! BUT ROME'S ROSEAL JACKET CAN TAKE IT! YESSIR, WHEN WE NEED DEPENDABLE POWER IN CORROSIVE ATMOSPHERES, WE SAY ROME'S ROZONE-ROSEAL POWER CABLE
USE ROZONE-ROSEAL POWER CABLE
REFINERIES
PAPER MILLS
STEEL MILLS
WHEREVER CORROSIVE CONDITIONS EXIST
4

Eight members of the Transmission and Distribution section of Northern States Power Co have been given new assignments. **J. C. Slothower** has been promoted to assistant superintendent of transmission and distribution; **W. L. Moline** to transmission operating engineer; **C. W. Lethert** to distribution engineer; **P. R. Heim** to assistant distribution engineer; **R. E. Warren** to street lighting engineer; **R. K. Kojola** to chief traveling distribution engineer; **W. C. Wegner** and **B. A. Richard** to traveling distribution engineers.

Oscar E. Willbanks has been named local manager at Elaine for Arkansas Power & Light Co. He succeeds **Thurman E. McCay** who will manage the companies properties at Marked Tree.

Richard G. Thyse, meter supervisor in Asheville for Carolina Power & Light Co, will retire after 35 years of service.

Jon D. Anderson has been appointed deputy director of the New York State Office of Atomic Development. He has been manager of the Schenectady, N. Y. Operations Office since Nov., 1950, which is responsible for administering the Atomic Energy Commission's contract with General Electric Co for operation of the Knolls Atomic Power Laboratory in Schenectady.

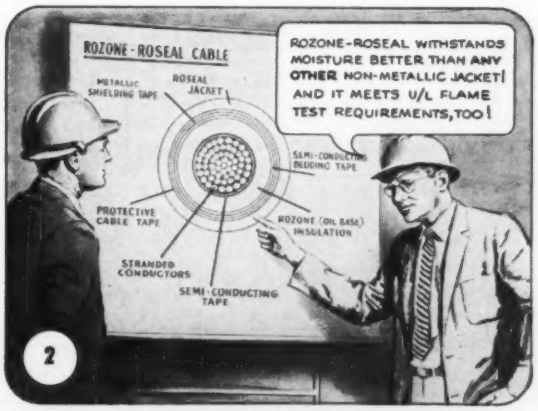
Herbert B. Cohn has been named director of four operating companies of American Electric Power System. He has been chief counsel and vice president of AEP Service Corp since 1954.

Dallas Power & Light Co has named **Newton A. King** assistant secretary-treasurer.

Atlantic City Electric Co has made new appointments in its divisions. **Lester C. Roe** was appointed manager of commercial and industrial sales for the Coastal Division, and **Charles W. Bennett** was named manager of residential and farm sales. **Charles W. Behler** becomes manager of commercial and industrial sales in the Valley Division, and **Elmer E. Williams,** manager of residential and farm sales. **William DeHaven** has been appointed district manager in the Valley Division, and **Bloomfield M. Phrampus** is the Millville district manager.

John H. Thompson has been promoted to division superintendent, Camden area, electric distribution dept, of Public Service Electric & Gas Co. **Ellis W. Edge, Jr.,** has moved to commercial manager, Passaic, succeeding **John Chambers** who retired May 29. **Alwin Ludwig** becomes commercial manager, Ridgewood.

Robert Kyle has joined Commonwealth Services, Inc., as a senior consultant.



Available in voltage ranges through 15 kv Rozone-Roseal preferred power cable may be installed in air, conduit, underground ducts, or directly in earth. Your choice of premium ozone-resistant insulations: Rozone (oil-base) or Rozone A (butyl-base). For complete information, contact your nearest Rome Cable representative and ask for Bulletin RCD-700. Or mail the coupon today.

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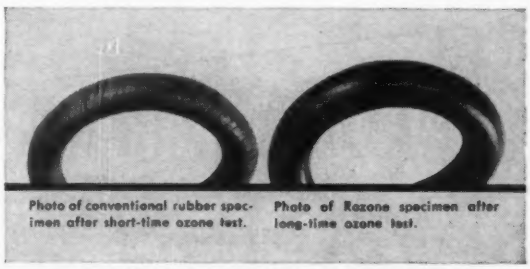

Photo of conventional rubber specimen after short-time ozone test. Photo of Rozone specimen after long-time ozone test.

Rozone insulation is high in dielectric and impulse strength and has excellent resistance to corona and ozone cutting.

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☐ I want to "Meet The Man" who can tell me more.

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Title.....
Company.....
Street.....
City.....Zone.....State.....

How CEI Helps Shape Downtown Cleveland

(*Continued from p 53*)

exodus to the suburbs. It would be reasonable to "plan for downtown Cleveland residential areas up to a total of 6,500 dwelling units by 1970," planners said. Present total is less than 2,000.

The planners also noted that movement of people and goods could be facilitated by an integrated transportation plan. In the master plan this features the building of a subway beneath Euclid Avenue to connect east and west branches of a new rapid transit system and also to help consolidate the central business district. CEI has taken no public stand on the subway, which was rejected last year by the County Commissioners although voters had previously approved a bond issue for its construction. Downtown transportation would be further improved by redistribution of automobile traffic around congested areas and by provision for an estimated 8,800 new off-street parking spaces.

Plans also were proposed for extension of the central lakefront to take advantage of the broad increase in air and seaway traffic. This would include additional berths for seaway cargo vessels and expansion of the existing lakefront airport to provide clearance for added traffic.

Finally, to make Cleveland's convention facilities "competitive with the best in the U. S.," the planners recommended addition of about 330,000 sq ft of new exhibition space to the present 110,000 sq ft of Cleveland's Public Hall. Accommodations for visitors would also include a new 600 to 1,000-room hotel in the downtown area and a "motel row" a little farther east of the central core.

This plan will get prompt consideration from the City Planning Commission and, if it is adopted, will serve as a general guide for entrepreneurs who cast their lot with the concept that the downtown area can be revived and revitalized.

It undoubtedly will have the full backing of a large segment of Cleveland's industrial complex.

"We believe in planning," says Howley, "and we believe in the importance of a downtown area that is alive and healthy. We also believe in controlled growth planning for the better uses of available land."

There may be things in the plan that will provoke controversy, but, according to CEI engineers, the important thing is there is, after all, a plan.

"Having a plan helps us a lot in doing our own planning on an organized basis. It makes our estimates of future power needs much easier," said a company engineer. He said a new sub-transmission substation was already definitely in the company's plan to increase the low voltage ac network for smaller downtown services such as light industry and smaller office buildings.

If the master plan is carried out by its target date of 1975, the power load of the downtown area will be substantially increased for CEI. New buildings will involve more business machines and office automation, more air conditioning, higher lighting standards, and other improvements that put added demands on electrical service. But CEI spokesman say there will be no problem in keeping up with these needs.

ROMAN ARMOR'S BEST...
IT'S REALLY EASY TO INSTALL ROME'S INTERLOCKED ARMORED CABLE... EVEN BENDING PRESENTS NO PROBLEM
1
LOTS OF AIR AROUND THE ARMOR... HEAT IS'NT BOTTLED UP HERE LIKE IT IS INSIDE CONDUIT. THAT'S WHY THESE CABLES CARRY MORE CURRENT
3
ARMORED CABLE TAKES UP LESS ROOM THAN MULTIPLE CONDUIT RUNS... AND SEE HOW NEATLY T.J. COPE LADDERS ACCOMMODATE IT
4

House Heating Poses Challenge

(*Continued from page 57*)

1% of total energy is produced by the top 20% of capacity. He illustrated further that the peak 5% of generating capacity is utilized only 20 hr annually in producing about 0.02% of total energy.

For annual use factors under 40%, diesel generators can show a lower total annual operating cost, including fuel and fixed charges, than can large conventional steam units. Gas turbines also can be shown as economical peaking units, but for annual use factors up to 15%. Although annual costs of gas turbines are higher than those of diesel units, the gas turbines have the advantage of being able to supply 15,000 kw in a single unit.

Smaller, lower first-cost peaking capacity also has the ability to come to full load quickly. With such units meeting the peaks, said Schulze, the larger steam turbine-generator units can operate at higher use factors, thus increasing their fuel efficiencies.

Economics of retiring generation may be determined through a comprehensive method which includes all tangible costs directly or indirectly resulting from retirements. Use of the method was discussed by Bruno M. Zambotti, Cleveland Electric Illuminating Co, who pointed out that intangible costs must be balanced with tangible costs in arriving at a solution.

In discussion, J. J. Ray, Philadelphia Electric Co, differed with the author over the consideration of inflation. PE Co has found that inflation largely is compensated by improvements in design, construction and utilization of major installations which "hold the line" on unit costs of capacity. Ray also said that results of retirement studies made by PE Co have been inconclusive in demonstrating the economic advantage of retiring older units. The only retirement justified was the removal of 44 Mw of vertical turbines to make space for a new 175-Mw unit.

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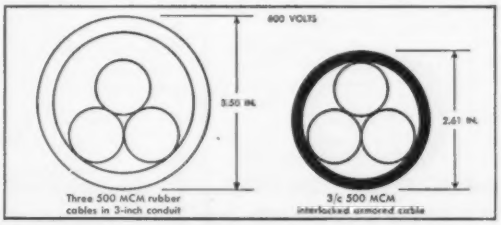

Reduced space requirements Less space is needed for Rome Cable's interlocked armored cable —almost one inch less width for each three-conductor 500 MCM interlocked cable than for cable-in-conduit type installations.

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Salary commensurate with past experience.

Send detailed resume giving age, education, previous experience and salary requirements to:

P-1801, Electrical World
Class. Adv. Div.,
P. O. Box 12, N. Y. 36, N. Y.

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Full line Electrical Conductor Division of Kaiser Aluminum offers position as:

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Qualifications: Requires thorough knowledge of use of insulated wire and cable products by utilities and large industrials. Must have electrical engineering degree and five to ten years' cable engineering, sales, and utility experience.

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KAISER ALUMINUM & CHEMICAL CORP.
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Graduate electrical engineer with experience in design, selection and application of lighting facilities for industrial plants, office buildings and utility power stations. Applicant should be capable of assuming responsibility for all technical problems related to lighting engineering, preparation of equipment and material specifications and supervision of preparation of design drawings.

Please send complete confidential resume including salary requirements.

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Staff position for graduate Electrical Engineer with experience in transmission line design, sag and tension calculations, economic studies, cost estimating, selection of conductors and structures, preparation of specifications and evaluation of quotations of suppliers. Salary open. Headquarters New York City.

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Graduate EE or ME, age 35-50 preferred, for engineering firm in Philadelphia. Requires extensive consulting or utility experience on property evaluations, cost of service determinations, rate case and operation studies. Experience in dealing with State regulatory bodies desirable. Must be competent to write reports effectively. Some travel involved.
Send confidential resume and salary requirements to:

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SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
4	1667	Mol.	69,000-34,500
3	833	West.	66,000-6900/11950
3	500	G.E.	66,000/33,000-2300/13200
3	500	Wagner	69,000-460
4	333	West.	67,000-7200
1	2500	Mol.	44,000-2400/4160, 3 Ph.
2	2500	Wagner	45,800/22,900-4160Y, 3 Ph.
3	500	G.E.	44,000-2400/4160
3	200	West.	44,000-480
1	5000	West.	34,500-13750/6875, 3 Ph.
1	3750	G.E.	34,400-13800/7960, 3 Ph.
2	3000	Upgf.	34,750-4160, 3 Ph.
2	1500	G.E.	34,400-2520, 3 Ph.
3	1000	A.C.	34,650/11,500-2300
3	500	Mol.	34,500-2300/4600
3	200	A.C.	34,500-2400/7200/12470Y
3	333	G.E.	26,400-2420/4190Y
2	2500	Wagner	22,900-4160/2400, 3 Ph.
2	1500	G.E.	23,000-2400/4800, 3 Ph.
1	7500	A.C.	13,800-2400, 3 Ph.
3	1667	G.E.	13,800-600
3	667	Kuhl.	13,800-480
1	600	Stand.	13,200-2300, 3 Ph.
1	450	Penna.	13,200-2400, 3 Ph. Askarel
3	333	G.E.	13,200/22800Y-2420/4190Y
3	333	Mol.	7200/12470-2400/4160
3	125	A.C.	6900-2300
3	100	G.E.	4800-120/240
3	400	G.E.	2300/4000-230/460
3	100	G.E.	2300/4000-230/460

FEEDER REGULATORS—OUTDOOR

1	750	G.E.	360 A. 12000 V. 3 Ph STEP
1	500	G.E.	694 A. 4160 V. 3 Ph STEP
1	375	G.E.	50.2A. 34500 V. 3 Ph STEP
1	250	A.C.	601 A. 2400 V. 3 Ph STEP
3	96	G.E.	200/400 A., 2400 V. 1 Ph IND
8	56	West.	150/300 A., 2400 V. 1 Ph IND

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3—500 KVA W-H 13200-2300/4000Y

3—333 KVA Mol. 2400-240x480

3—333 KVA A-Ch. 2400-120/240

3—400 KVA W-H 11500-2400/4800

3—333 KVA W-H 67000-480

6—167 KVA G-E 7200-2400/4160Y

6—150 KVA G-E 2400-120/240

6—150 KVA G-E 7200-240/480

1—750/938 KVA G-E 3-Ph. 33000-6900Y TCUL equip. fan cooling

1—1000 KVA W-H 3-Ph. 33000-7200Y TCUL equip.

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The Meetings Calendar

JUNE

National Electrical Manufacturers Association—Board of Governors, NEMA Office, New York City, June 16.

Electrical Precipitation Seminar—Pennsylvania State University, University Park, Pa., June 14-19.

United States Committee for the International Conference on Information Processing—Representing the Institute of Radio Engineers, the Association for Computing Machinery and the American Institute of Electrical Engineers, Paris, France, June 15-20.

National Association of Purchasing Agents—Waldorf-Astoria Hotel, New York City, June 14-17.

American Society of Mechanical Engineers — Semi-Annual Meeting, Chase-Park Plaza Hotel, St. Louis, Mo., June 14-18.

American Nuclear Society—Annual Meeting, Gatlinburg, Tenn., June 15-17.

Wood Pole Institute—University of Wisconsin, June 15-19.

National Society of Professional Engineers—Annual Meeting, Commodore Hotel, New York City, June 17-20.

Engineering Progress Exposition—Sponsored by the National Society of Professional Engineers and its New York State Chapter, Hotel Commodore, New York City, June 17-20.

Pennsylvania Electric Association—Customer Contact Committee, Pocono Manor, Pa., June 18-19; Industrial Committee, Shawnee on the Delaware, June 18-19; Plant Accounting and Records Committee, Skytop, Pa., June 18-19; Taxation Committee, Split Rock Lodge, White Haven, Pa., June 22-23; General and Customers' Accounting Committee, Bedford Springs, Pa., June 25-26; Personnel Practices Committee, Bedford, Pa., June 25-26.

• **American Society of Mechanical Engineers**—22nd Applied Mechanics Division National Conference, Lecture Hall, Russell Sage Laboratory, Rensselaer Polytechnic Institute, Troy, New York, June 18-20.

Air Pollution Control Association—Annual Meeting, Statler Hotel, Los Angeles, Calif., June 21-26.

American Institute of Electrical Engineers—Summer and Pacific General Meeting, Olympic Hotel, Seattle, Washington, June 21-26.

American Society for Testing Materials—Annual Meeting, Chalfonte-Haddon Hotel, Atlantic City, N. J., June 21-26.

Michigan Electric Association — Annual Meeting, Mackinac Island, Michigan, June 22-23.

Fifth Annual Creative Problem-Solving Institute—University of Buffalo, June 22-24.

American Society of Refrigerating Engineers—Annual Meeting, Lake Placid Club, Lake Placid, New York, June 22-24.

• **American Association of Cost Engineers**—Third Annual Meeting, Carnegie Institute of Technology, Pittsburgh, Pa., June 24-26.

Canadian Electrical Association—Annual Convention, Manoir Richelieu, Murray Bay, Que., June 24-26.

• **Second Nuclear Instrumentation Symposium**—Sponsored by the Instrument Society of America, Idaho Falls, Idaho, June 24-26.

• **Edison Electric Institute**—American Gas Association—Depreciation Accounting Committee, Chatham Bars Inn, Chatham, Mass., June 25-26.

• **Utility Commission Engineers**—37th Annual Conference, Sheraton-Palace Hotel, San Francisco, Calif., June 30-July 2.

• **International Electrotechnical Commission**—Annual Meeting, Madrid, Spain, June 30-July 10.

JULY

• **Edison Electric Institute**—Accident Prevention Committee, Biltmore Hotel, Los Angeles, Calif., July 6-8.

•. Additions this week.

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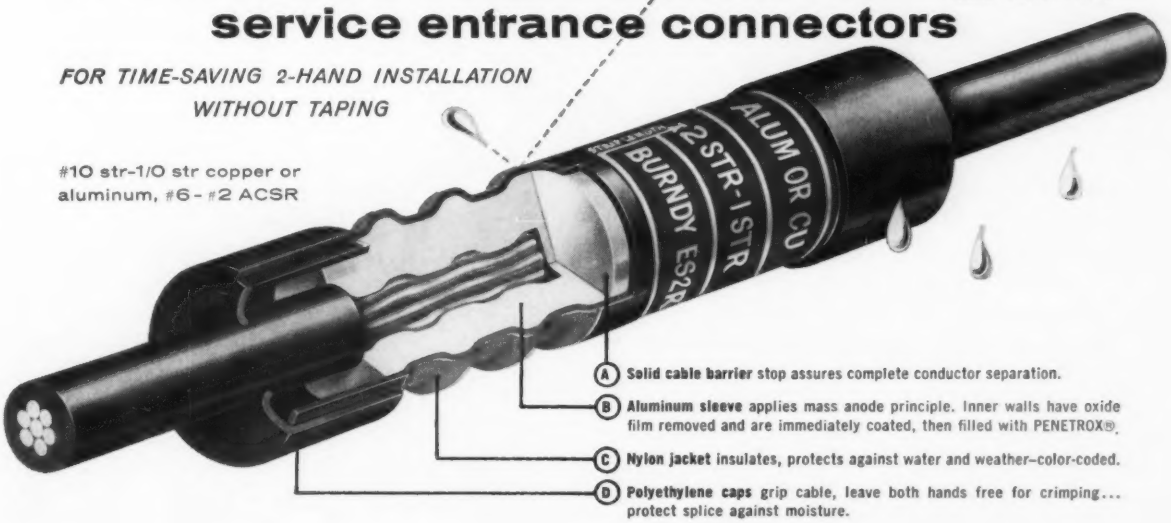

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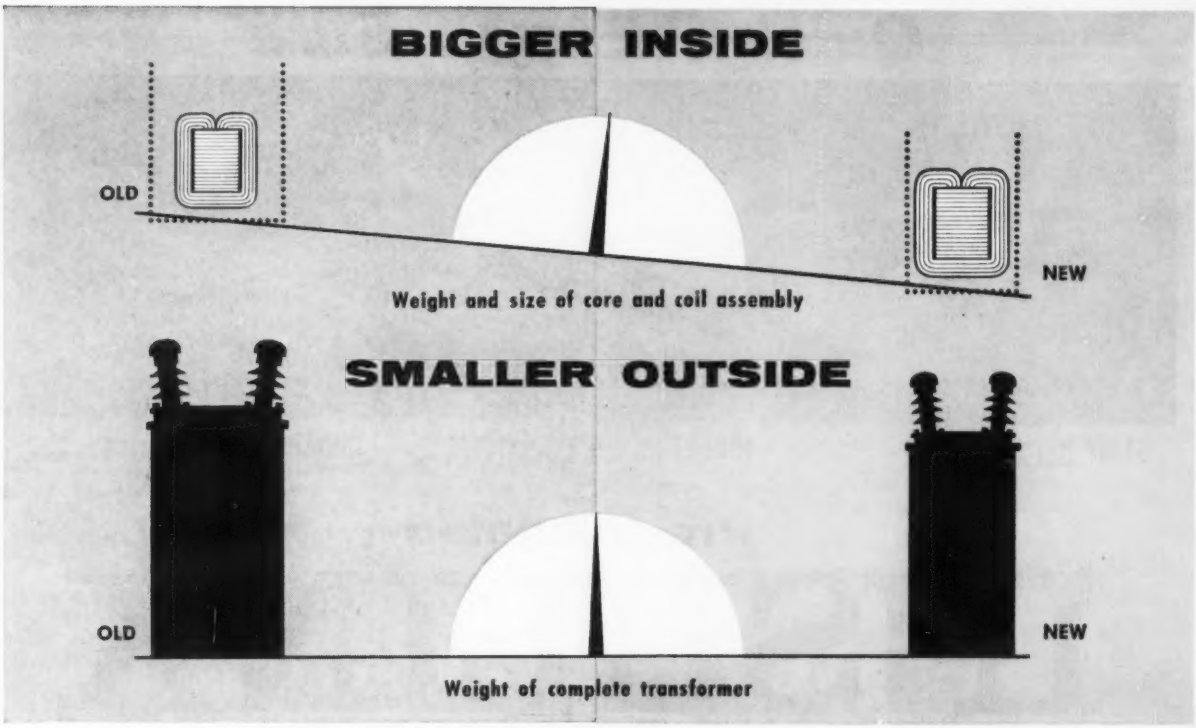

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